

APRIL 1975 75 CENTS

Popular Mechanics

SPECIAL SECTION!

**Spring Home
Improvement
Guide**

■ PROJECTS
■ PLANS
■ IDEAS

30 FRESH WAYS TO SPRUCE UP YOUR HOME

- Add a deck for summer fun
- Create new indoor storage space
- Build one of these 3 sewing centers
- Make our fold-up patio table
- Design a gala basement playroom
- ...and much, much more!

CARS: Specs and best-buy tips
for all the '75 imports.
Plus: Cordoba Owners Report

High adventure in Alaska:
That pipeline gets rolling!

**56 riding mowers that
make sport of yard care.**
Extra: Tractor from a kit

**10 best ways to trim down
and shape up for summer**

Brilliant quad sound!
PM rates 9 new 4-channel
cartridges and picks the best

**20 top fishing lures that
are out-catching 'em all**

This add-on deck
features 3 great
ideas you can use
on any house. See
Home Ideas Guide



Introducing the first

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The hood of the Pacer looks the way

it does because it was designed for aerodynamic reasons. To reduce the wind resistance. So the engine doesn't have to work as hard at highway speeds. And so you wind up with better gas economy.

(The Pacer comes with AMC's proven 6-cylinder engine and a 22-gallon gas tank. Which means you get outstanding performance, excellent economy and long-distance driving range.)

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wide small car.

door even bigger than the driver's. So you can get in and out of the back that much easier. (We also gave the Pacer a hatchback so you can get your luggage in and out that much easier, too.)

This same ingenuity was also applied to Pacer's visibility. We wanted you to see as far as your eye can see. From our point

of view, that meant designing the car for better all-round vision. From your point of view, you'll be able to notice all the people noticing you.

A final point. The AMC Pacer, the wide small car, is covered by the wide coverage: AMC's exclusive BUYER PROTECTION PLAN.[™]

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AMC  PACER



This One



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ON THE COVER

Spacious redwood patio designed by John Matthais of San Rafael, Calif., for the home of Ernest Braun. Photo by owner. See page 113.

WORTH WAITING FOR

Looking for more ideas and information? See page 127.

AS A SERVICE TO READERS, *Popular Mechanics* publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, *Popular Mechanics* cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from plans published in this magazine.

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SPECIAL FEATURES:

PM's Home Ideas Guide: 30 ways to improve your home, including new deck, basement playroom, indoor gardens and storage, and much more. Page 111.

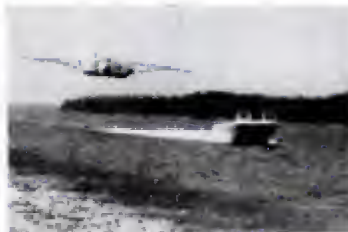
'75 imported cars. PM's auto editors offer expert tips and a comprehensive chart listing specifications and comparisons for all the imports. Page 70.

PM's pick: The top 20 lures to catch the lunkers. Put these winners in your tackle box; they'll keep you in fish throughout the world. Page 63.

Fabulous phono cartridges for new four-channel "Quadradisc" records. PM tests nine of these new supercartridges and picks the best. Page 66.

Let your mower do the yardwork. A roundup of 50 versatile riders with their mulchers, grass baggers, utility carts and other accessories. Page 78.

Are you in shape for spring? New medical research offers training that's fun and will help keep you from being another hospital statistic. Page 101.



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Sportsman's optional single rear door has a big panoramic rear window. No one else has it. (Standard are two swing-out doors.) What about getting in and out on the side? You can go with our swing-out doors. Or you can opt for one that slides.



Maxiwagon. (It's 15 people big.)

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With a standard 23-gallon gas tank, Sportsman lets you take off for parts unknown without constantly taking time out for fill-ups. If you really want to fill 'er up, you can opt for our big 36-gallon tank.

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No one likes a bumpy ride. And Sportsman's independent front suspension is there to see that you don't get one. Even on the roughest roads, it soaks up every bump in sight. One wheel at a time.

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Sportsman handles itself well in every situation. Curb to curb, its turning diameter is over three feet shorter than either Ford's or Chevy's.

Smaller standard tires.

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KING: 18 mg. "tar", 1.2 mg. nicotine,
SUPER KING: 19 mg. "tar", 1.3 mg. nicotine, av. per cigarette, FTC Report OCT. '74.

SCIENCE WORLDWIDE



Lasers for safety research

The extreme precision of the laser beam is being used by General Motors researchers to pinpoint the location of dummies used in safety tests at the GM Research Laboratories, Warren, Mich. The multiple exposure photo (below) shows actual low-power laser beams zapping targets located on the anthropomorphic dummy. The system makes it possible to achieve repeatable conditions and reduce variations that occur in test results.



GM researchers are engaged in a number of studies for the purpose of developing dummies with manlike responses for automotive crash testing.

School texts going metric

A survey of state education departments shows the swing to the metric system is accelerating, reports Dr. Betsy Ancker-Johnson, assistant secretary for science and technology, U.S. Department of Commerce. Virtually every state has under way some type of statewide activity related to teaching the metric system, Dr. Ancker-Johnson notes.

Some states plan to convert all textbooks to metric by 1976 or 1980, while others indicate they may be teaching metric as the principal measuring system by 1984. The Department of Commerce has published a

package of metric information designed as an aid for the teacher, student or businessman. It costs \$2 and is available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Ancient rocks in Minnesota

Rocks said to be 3.8 billion years old—the oldest thus far found on Earth—have been discovered in southwestern Minnesota, according to Dr. Carl E. Hedge, U.S. Geological Survey, and Dr. Samuel S. Goldich, Northern Illinois University. The ancient rocks—a granite gneiss—occur along the valley of the Minnesota River and are particularly well exposed near the town of Granite Falls, Minn. The two scientists used radioactive dating methods to determine the age of the rocks. Samples returned by Apollo astronauts indicate that lunar rocks are between 3.3 and 4.5 billions years old. Many scientists believe that the Earth and moon are about the same age—some 4.5 billion years old.

Corn strain resists borer

Corn with high resistance to two of its worst insect pests—the European corn borer and the sugar cane borer—has been discovered by Cornell University scientists. An exotic strain from Central America, the corn is said to be the first ever found with a built-in resistance to both types of borer. Cornell researchers say the strain "offers promise as a breeding line for incorporation of resistance into commercial varieties."

Gas ends bloom of youth

To some plants, aging is a gas—ethylene gas. The tasteless, odorless and colorless gas triggers the aging process in orchids, morning glories, apples and bananas, according to Michigan State University botanist Hans Kende.

"Ethylene is the reason why one rotten apple can spoil a whole bushel," says Dr. Kende. "The bad apple produces ethylene, which triggers aging and more ethylene production in the other apples."

Goal of Dr. Kende's research is to

discover what happens within cells when they get old. He is studying the aging process in morning glories that open, grow old and die in a day. He has found that ethylene mixed with air in concentrations as low as one part per million is enough to accelerate flower aging by several hours. Dr. Kende believes his ultimate findings could have important implications for the food-processing industry.

Dental camera pinpoints plaque

An ultraviolet camera for detecting plaque on teeth has been developed by American and Canadian researchers at the State University of New York at Stony Brook. Plaque is a film of protein that causes decay through bacterial action. Normally invisible, it shows up as dark areas on teeth when hit with ultraviolet light. A small tube with a lens is inserted against patient's clenched teeth, and the image recorded on



Polaroid film for inspection. Above, left photo was taken with normal light, right photo with ultraviolet light. ***

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What motorcycling will do for you... what you should do for motorcycling

Motorcycling has come of age. It offers the same freedom and exhilaration as ever, but a new dimension has been added: motorcycling is now recognized as safe, economical transportation.

Motorcycles are ridden by 18 million men, women and youngsters, with most of the cycles in the U.S. being licensed for street use. These are touring, commuting and enduro models.

Touring cycles—the largest machines with the most powerful engines—provide comfort and performance for long-distance, open highway traveling.

Commuting cycles may also be driven cross-country, but they are smaller and less powerful, being designed primarily for those seeking around-town transportation—traveling to and from school, work, shopping plazas or whatever.

Enduro models are dual-purpose machines. They are rugged enough for off-road use, but possess sufficient equipment and power to

make them legal for street and highway use.

By contrast, off-road ("dirt") bikes are stripped of equipment, such as lights, which preclude their licensing for road use. Designed for fun-riding on trails, in deserts and in competition, "dirt" bikes range in size from minicycles, which give youngsters and beginners the feel of off-road riding at safe and controlled speeds, to bikes that equal touring models in size and power.

Pound for pound, a motorcycle gives the most economical means of motorized transportation. The largest cycles average 56 miles per gallon, while the smallest average an incredible 110 miles per.

Most cyclists do their own minor maintenance, consult-

ing a trained technician at their dealer's when a job calls for a professional. Maintenance costs are easy to live with, but remember that neglect is the quickest way to kill a cycle. Service must be done! Data in this section can be very helpful—especially if mechanical troubles develop along the road. So keep this presentation in your bike's tool compartment.

What about motorcycle safety...the inevitable question. Over 60 percent of cycle-auto accidents are the fault of the car, but this is not the point. As the motorcycle has come of age, the cyclist has worked to prevent accidents. Witness the 100,000 youngsters now enrolled in high school motorcycle driver education courses nationwide who are being trained by accredited teachers who themselves are trained cyclists. Motorcycle "ed" is normally sponsored by a responsible agency, usually the police.

One unit of motorcycle "ed" deals with proper clothing, an important aspect of safety. Here's the kind of information that students are getting...





Helmets are a "must" for the driver and passenger. Most state laws require that cyclists wear them, but that's academic. Anyone riding a motorcycle who doesn't wear a helmet is foolish. The likelihood of serious injury in case of an accident is decreased 100-fold with one.

There are two general types of helmets. The helmet giving maximum protection is the total helmet, which covers the entire head, chin and mouth. It is often outfitted with a flip shield to also protect the entire face. Use a total helmet especially for off-road riding. For street cycling, the full coverage helmet that protects the entire head, but not the chin and mouth, will suffice.

Make sure your helmet fits correctly and is worn with a securely fastened chin strap. Select a helmet that gives you the most protection—those approved by the Snell Memorial Foundation, or meeting your state's specifications.

Eyes must also be protected, and devices must provide

maximum visibility. This precludes the use of windshields alone, which protects you from wind and insects, but doesn't keep dirt out of the eyes and may not protect you from flying stones. You can wear a full shield or goggles that...

- Offer a means of secure fastening, so they don't blow off.
- Are shatter-proof and free of scratches.



- Are adequately ventilated to prevent clouded vision.
- Have clear lenses if you are going to drive at night. Never wear dark or tinted lenses for night driving.

Other gear that protects you from injury—and from cold, wet and wind—are gloves, heavy footwear, jackets and pants.

Always wear leather gloves. However, they shouldn't be so heavy that they make gripping difficult. A good pair of gloves improves your grip and keeps hands from getting cold, tired and sore.

Knee-high boots that are water-resistant, padded for comfort and have crush-proof toe areas provide maximum protection and are especially recommended for off-road cycling. If these are not available, at least wear a pair of high-top boots or shoes that cover the ankles. Never ride on-street or off with bare feet or wearing sandals. You will be inviting injury.

Thick, tough jackets and pants keep out the cold, but more important, they help prevent injury. See to it that clothing offers freedom of movement and can be closed off at cuffs, collar and front to keep out weather. And it also helps if clothing is brightly colored so others can see you, especially at night.



How to take care of your motorcycle

The surest way to guarantee that your motorcycle will provide efficient, safe operation is to form a close relationship between yourself and your dealer. You can take care of procedures you feel confident doing and leave the others to him. Here are 11 tasks you may want to perform. The presentation is not all-inclusive. Other jobs, such as changing engine oil, are covered in your owner's manual, which should be the final authority.



Adjust brake, clutch, and throttle cables, and keep aware of brake lining wear by checking the indicator. Have your dealer lubricate cables periodically.



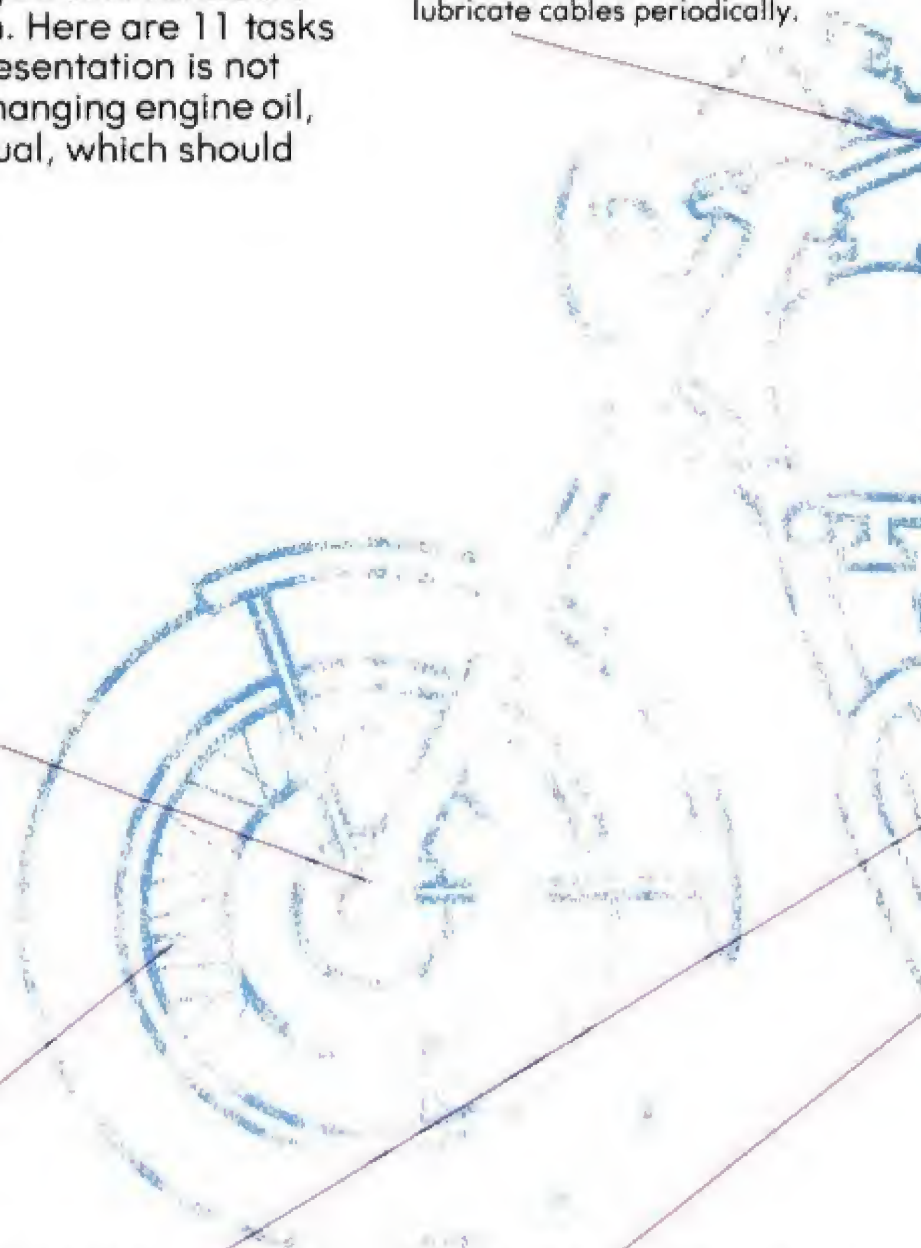
Push down on the handlebar and see that oil doesn't leak from the front fork. Oil should be changed periodically, a job you may want your dealer to do.



Keep tires alive by maintaining correct pressure. Don't take chances with worn or damaged rubber. Bad tires have been the cause of many serious accidents.

Service the air filter to maintain free air intake. Restrictions cause power loss, high gas consumption and fouled spark plugs.

Check battery regularly. Top with distilled water if necessary. Never add acid to the battery. Keep the terminals clean.

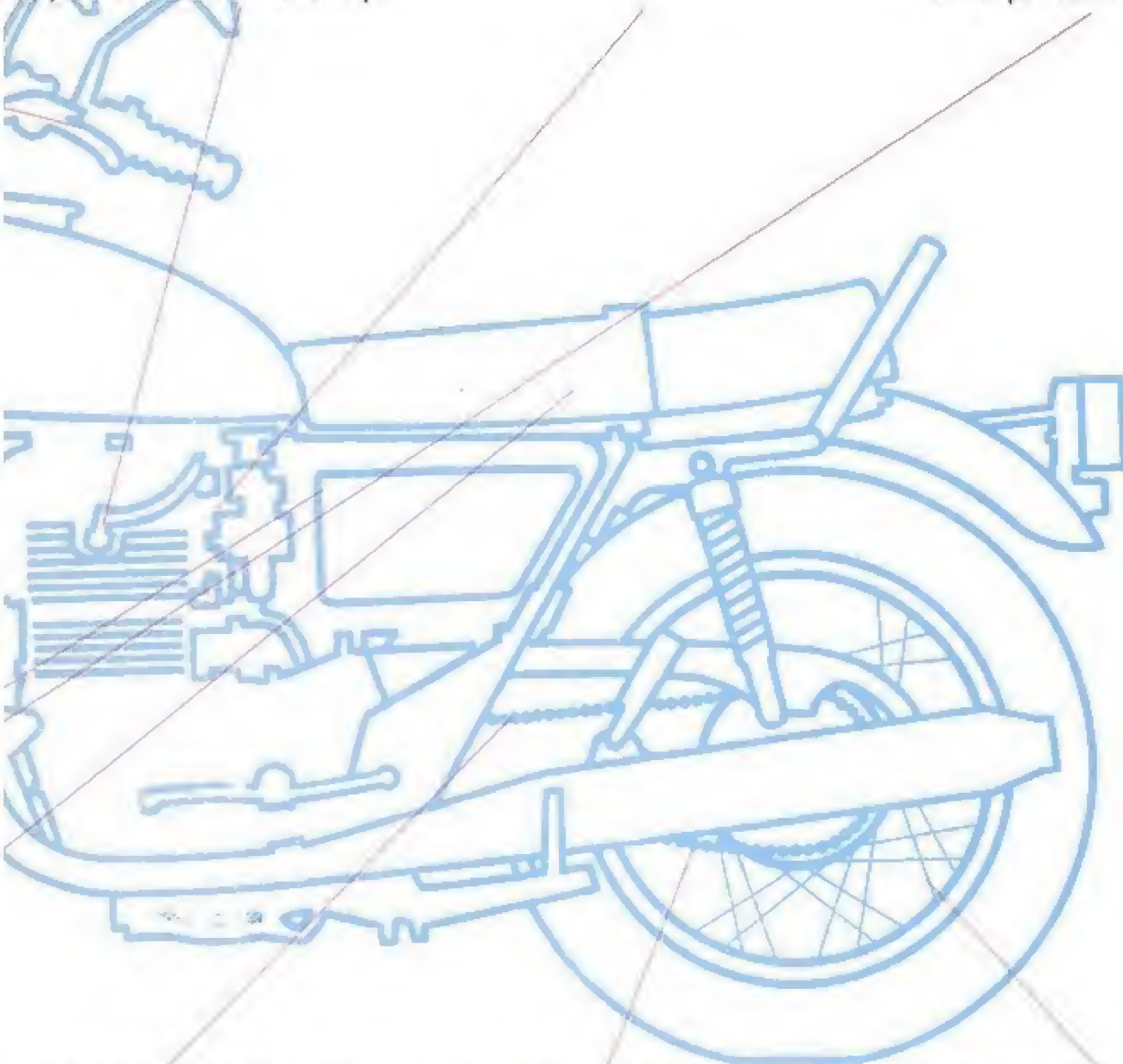




Service the spark plugs regularly. Inspect the firing ends for signs of engine problems. Worn plugs impair good performance. Replace them when necessary.

Clean out the fuel tap regularly to prevent water or sediment that accumulates from restricting the flow of fuel to the carburetors.

Tighten all body bolts and nuts before riding to prevent unnecessary vibration that can damage parts. See to it that all cotter pins are in place.



Your motorcycle should receive a general lubrication periodically, but the drive chain should be lubricated every time you ride.

A properly adjusted ($3/4"$ to $1"$ play) chain is needed for safe riding. Check it regularly and inspect sprockets for damage and wear, too.

Alternately tap and tighten spokes until they "ping." Your dealer should tighten them to specification when he has the cycle.



Spark plugs: the heart of your engine

CONDITIONS TO LOOK FOR



Nominal electrode wear and tan firing-end color... correct plug is being used.



Oil or carbon fouling indicates improper heat range or engine problem.



Bridging indicates excessive carbon in cylinder or use of improper motor oils and/or mixtures.



Aluminum deposits identify preignition... Serious problem! Check with dealer.

HOW TO SERVICE SPARK PLUGS



If plug isn't badly worn, wash it in solvent to remove deposits; let dry.

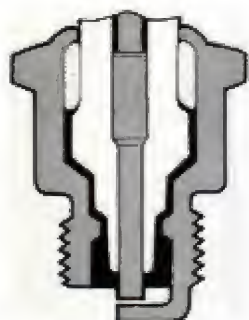


Carefully open side electrode and file until electrode surfaces are flat and edges are sharp.

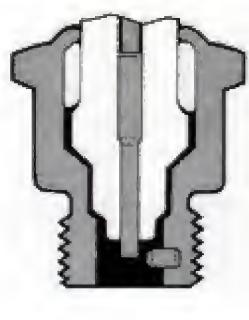


Gap electrodes to specification, resetting side electrode with a gap tool.

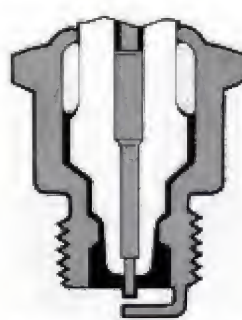
TYPES OF PLUGS THAT CHAMPION MAKES



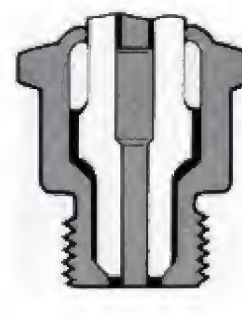
Standard design: long-mileage plug offering superior service with conventional ignition.



Retracted gap: recessed side electrode accommodates engines with long-stroking pistons.



Gold Palladium: reduces starting and fouling problems, and provides longer service life.



Surface gap plug: specially designed to meet peak voltage output of CD ignition systems.

Picking the right spark plug for your engine



NORMAL

This is the spark plug the cycle maker suggests you begin with. Examine in few hundred miles — if insulator at tip looks burned white, switch to colder plug; if black, a hotter plug is required.



COLD

A cold type spark plug has a shorter insulator nose and is able to get rid of heat quickly. Colder spark plugs are used in cycles that must endure continuous high speed and heavy riding.




HOT

A hot type spark plug has a longer insulator nose and retains heat longer to burn away combustion deposits. Hotter plugs should be used in cycles that are ridden mainly at slow speeds or must experience prolonged periods of engine idling.

Begin with the normal Champion spark plug for your model that is shown here. If your inspection shows that a hotter or colder plug is needed, switch to the next one on the heat range scale. Your dealer has the necessary tables to enable you to find the exact plug your engine needs. **Consult with him also to determine the Champion plug to use if your motorcycle is not listed.**

| Model • Champion Standard Spark Plug | | Model • Champion Standard Spark Plug | | Model • Champion Standard Spark Plug | |
|--------------------------------------|----------|--------------------------------------|-----------|--------------------------------------|----------|
| BENELLI | | HONDA | | PENTON | |
| Sei 750 | N-3-MC | Trail 90 | P-8Y-MC | Mint 400 | L-78-MC |
| Tornado 650 | N-3-MC | ATC70 | Z-10-MC | Mint 250 | L-78-MC |
| Quattro 500 with 14mm heads | N-3-MC | All 65's | Z-6-MC | Jackpiner | L-78-MC |
| Quattro 500 with 12mm heads | R-6-MC | C105 | Z-8-MC | 6-Day | L-78-MC |
| Super Sport 250 | N-3-MC | MR50 | L-86-MC | Berkshire | L-78-MC |
| El Diablo, Phantom 250 | N-3-MC | 250 | Z-10-MC | | |
| Sprite El Diablo 200 | N-3-MC | HUSQVARNA | | PUCH | |
| Enduro 175 | N-4-MC | 450SB | N-3-MC | MC250 | N-3-MC |
| El Diablo 125 | N-3-MC | 400 Moto-Cross | N-6Y-MC | 175TE | N-2-MC |
| Panther 125 | N-4-MC | 400CR | N-3-MC | 175S | N-3-MC |
| Banshee 90 | N-4-MC | 360 Enduro | N-4-MC | 125TE | N-2-MC |
| Woods, Cougar, Harnet 65 | N-4-MC | 360 Moto-Cross | N-6Y-MC | 125S | N-3-MC |
| Monaco 50 | N-4-MC | 250 Moto-Cross | N-6Y-MC | Trail 125 | N-3-MC |
| | | 250 Enduro | N-2-MC | 50S | L-81-MC |
| BMW | | 250CR | N-3-MC | | |
| R90/6 R90S | N-6Y-MC | 125 Moto-Cross | N-2-MC | RICHMAN | |
| R75/5, /6 | N-7Y-MC | | | Moto-Cross 250, 1/2" reach | L-57R-MC |
| R60/5, /6 | N-7Y-MC | JAWA | | Moto-Cross 250, 3/4" reach | N-57R-MC |
| R50/5 | N-7Y-MC | 500DT | L-87R-MC | Enduro 125 | L-81-MC |
| | | 175 Street | L-86-MC | | |
| BULTACO | | 125 Street | L-86-MC | | |
| Astro 360 | N-57R-MC | Trail 90 | L-86-MC | ROCKFORD | |
| El Montadero 360 | N-3-MC | | | Taka | L-81-MC |
| El Bandido 360 | N-2-MC | KAWASAKI | | Tora | J-6J-MC |
| Sherpa T 350 | N-12Y-MC | Z1 | N-4-MC | | |
| Astro 250 | N-57R-MC | All 650's | N-4-MC | SUZUKI | |
| Metralia 250 | N-3-MC | HIR Roadracer | N-57R-MC | GT750 | N-4-MC |
| Alpina 250 | N-12Y-MC | F12MX | L-77J-MC | GT550 | N-3-MC |
| Pursang 200 | N-57R-MC | KZ400 | N-3-MC | TM400 | N-3-MC |
| Sherpa 175 | N-57R-MC | Mach II-S2 | L-78-MC | TS400 | N-4-MC |
| Lobito 175 | N-3-MC | F5 Bighorn | UL-17Y-MC | GT380 | N-3-MC |
| Sherpa S 125 | N-54R-MC | F4 Sidewinder | L-78-MC | T350R | L-81-MC |
| Lobito Mk III 125 | N-3-MC | F11 | L-78-MC | TR250 | E-55-MC |
| Alpina 125 | N-3-MC | 250 MX | L-77J-MC | TS250 | N-3-MC |
| Tiron 100 | L-86-MC | KX250 | N-2-MC | TC200 | L-78-MC |
| | | 175 Enduro | L-20V-MC | TS185 | L-81-MC |
| CZ | | Super 150 | L-81-MC | GT185 | L-86-MC |
| Moto-Cross 400 | L-87R-MC | B series 125's | L-81-MC | TI25 | L-78-MC |
| Moto-Cross 360 | L-57R-MC | F6 Enduro | L-78-MC | RV125 | L-81-MC |
| Street 360 | L-81-MC | KX125 | N-2-MC | TM125 | N-3-MC |
| Grand Prix 250 | L-57R-MC | C2TR | L-78-MC | TC120 | L-78-MC |
| Enduro 250 | L-81-MC | G4 Trail Boss | L-78-MC | A100RT | E-59R-MC |
| Trail 175 | L-81-MC | G31M Centurion | L-77J-MC | TS100K, 1/2" reach | L-78-MC |
| Moto-Cross 125 | L-57R-MC | G3SS | L-81-MC | TS100K, 3/4" reach | N-3-MC |
| Street 125 | L-81-MC | MT1 Dynamite | L-81-MC | N-3-MC | |
| Trail 90 | L-81-MC | MB1 Coyote | J-7J-MC | TS90 Honcho | L-81-MC |
| | | | | RV90 | L-87Y-MC |
| DUCATI | | MAICO | | TM75L MX | L-81-MC |
| 750 | L-81-MC | MC501 | N-2-MC | AC50 | L-78-MC |
| Desmo 450 | L-81-MC | MC400 1/2" reach | L-77J-MC | | |
| Scrambler 350 | L-81-MC | MC250 1/2" reach | L-77J-MC | YAMAHA | |
| Sebring 350 | L-81-MC | MC250 3/4" reach | N-2-MC | TX750 | N-4-MC |
| Monza 250 | L-81-MC | MC125 | L-77J-MC | TZ750 | N-54R-MC |
| Gran T 200 | L-78-MC | | | TX500 | R-8-MC |
| Silverstone S 175 | L-78-MC | MOTO GUZZI | | SC500 | N-3-MC |
| Monza Jr. 160 | L-78-MC | Eldorado V850 | N-3-MC | YZ360 | N-2-MC |
| Bronco 125 | L-86-MC | Ambassador V750 1/2" reach | L-81-MC | RD350 | L-78-MC |
| 125F3 | L-57R-MC | Ambassador V750 3/4" reach | N-4-MC | TR2 Road Racer | N-57R-MC |
| Scrambler 100 | L-86-MC | Sport 750 | N-2-MC | TZ350 | N-54R-MC |
| Mountaineer 100 | L-78-MC | V700 | N-3-MC | All YM305's | L-81-MC |
| | | Sport 125 | N-3-MC | DT250 | N-3-MC |
| HONDA | | Trail 125 | N-1-MC | RD250 | L-81-MC |
| CB750 | R-8-MC | NORTON WILLIERS | | TY250 | N-4-MC |
| CB550 | R-10-MC | Commando 850 | N-7Y-MC | CS200 Street | L-77J-MC |
| CB500 | R-10-MC | Commando Fastback 750 | N-7Y-MC | DT175 | N-3-MC |
| All 450's | N-3-MC | High Rider 750 | N-6Y-MC | All YCS175's | L-78-MC |
| CL360 | N-3-MC | Mercury 650 | N-4-MC | YAS 125 | L-81-MC |
| CB350 | R-8-MC | | | TA125 | N-54R-MC |
| CR250M | N-1-MC | OSSA | | YLT100 Moto-Cross | L-57R-MC |
| MT250 | N-3-MC | Yankee Enduro 500 | N-60Y-MC | LT2 100 | L-78-MC |
| CB250 | N-3-MC | Pioneer Enduro 250 | N-2-MC | Enduro 90 HT1 | L-81-MC |
| XL250 | R-8-MC | American Enduro 250 | N-2-MC | GT1 80 | L-86-MC |
| CB200 | R-8-MC | Sport America 250 | N-3-MC | RD60 | L-81-MC |
| CR125M | R-1MC | Trail 250 | N-9Y-MC | | |
| SL125 | R-6-MC | American SCR 250 | N-57R-MC | ZUNDAPP | |
| MT125 | N-3-MC | All 230's | N-3-MC | 125 Moto-Cross | L-78-MC |
| All 100's | R-6-MC | Pioneer 175 | N-3-MC | GS125 | L-77J-MC |
| Super S90 | P-7-MC | American Enduro 175 | N-60Y-MC | MC125 | L-77J-MC |
| | | Stiletto 175 | N-2-MC | Scrambler 100 | L-78-MC |
| | | Phantom 125 | N-57R-MC | KS50 | L-78-MC |



The last word in Riding.

We saved the last page in our "Riding" booklet for the last word in premium motorcycle spark plugs: Champion *Gold Palladium* spark plugs. Compared to standard design plugs, they require much less voltage to fire. And they have specially designed firing ends to fight fouling deposits. All for faster, more dependable starts; smoother performance; long plug life.

Do they do the job? In 1974 alone, 13 world and national motorcycle

champions won their titles with premium performance Champion *Gold Palladium* spark plugs.

So remember: When it comes to spark plugs, for competition or pleasure, the last word in "Riding" is definitely the last word in motorcycle performance: Champion *Gold Palladium* spark plugs.



We've got your plug.

LETTERS

FROM READERS

Solar gimmick

I seriously feel the solar furnace you featured in your February 1975 issue (*First Plug-In Solar Furnace for Your Home*, page 102) is nothing more than a gimmick. I live 65 miles from Buffalo and, using your figures, could save about 26 percent of fuel. With a 26-percent-a-year saving, it would take 18 years to pay off the investment.

T. OWEN HULL
PITTSFORD, N.Y.

You're right that solar heating offers limited fuel savings in cold cloudy areas like Buffalo. However, the article did not state that such regions were ideal for its use—merely that they were examples of localities in which the furnace would still provide some auxiliary heating. Also, the 26-percent figure was for the smallest unit available. With larger models, estimated savings could run as high as 43 to 86 percent.

The article was very interesting. The use of air as a working fluid and stone as a storage medium has several attractive and practical advantages. Mr. Keyes states that "Water is a terrible storage medium. . ." The implication of such a statement could be misleading.

Using 30,000 BTUH as the heat loss for an average tight house in 30° to 35° F. weather, calculations show that it requires 36 tons of rock but only seven tons of water to store heat for a day. From a space standpoint, water is much more efficient by a factor approaching 4 to 1.

ROBERT ABRAMSON, P.E.
UPPER SADDLE RIVER, N.J.

Better than commercial units

I built the Scuba Tow (page 69, July '74) as close to your plans as pos-



sible. In testing in a YMCA swimming pool, it performed above and beyond my expectations. Its speed, power, and handling are, in my opinion, better than commercial units I have used. As you can see, I am very happy with this craft and I hope that you have every success with it.

HAROLD SNYDER
MONT CLARE, PA.

Other readers who would like to build the Scuba Tow can get the complete plans simply by sending \$7.95 to PM Scuba Tow, Box 1014 Radio City Station, New York, N.Y. 10019.

Not enough zip in the zap

I've been following the Uniform Product Code progress and welcomed your write-up (*How You'll Zip Through the Zap-Out Counter*, page 100, Feb. '75).

As a business person myself, I can well appreciate the advantages of accurate automated inventory controls. However, as a housewife-consumer, I deplore the lack of consideration afforded me.

You admit that "nobody is predicting that the new systems actually will lower food prices." Thus the consumer is being asked to underwrite greater profitability and efficiency for the grocer with questionable return. Labor and its costs seem to be the primary area in which savings can be expected.

Some proposals recommend shelf price tags. We've all seen how poorly such tags are placed and maintained for unit-pricing.

I don't need a tape that tells me the lane, the checker and the time of day I paid for my groceries. I don't need a tape that prints 32 characters for each item. I don't need to spend \$80, then sit down and leisurely read a beautifully detailed tape to find out, finally, what I paid for each item. I need the price on the item before I buy it.

Thanks, but no thanks.

LINDA CARTER MAKUCH
WILLINGTON HILL, CONN.

Your opinion is shared by others who have written in to complain that the system is designed to benefit the store, not the shopper. While this is largely true, the point of the article

(Please turn to page 18)



ENGINE CLEANER

ENGINE-BRITE,
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engine cleaner.
Spray it on, hose
it off. Powerful,
self-emulsifying
degreaser.





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LETTERS

(Continued from page 17)

was to acquaint readers with the complex and ingenious technology behind the strange gadgets they'll soon be seeing in supermarkets and will probably be wondering about. Also, there are some legitimate consumer advantages: You'll get through the checkout faster because the clerk has less to do, you won't have to watch the cash register like a hawk in fear of errors and, with improved inventory control, you're less likely to find your store out of your favorite brand of beans or applesauce. So it ain't all bad.

PM's new size helps

My compliments upon the change in format. Several students have commented that they like this better and that it is now easier to read the articles. And as a librarian, I would like for you to know that it is much easier to file and store back issues because it is the standard size of most magazines.

DRUCILLA JONES

LIBRARIAN

AVALON MIDDLE SCHOOL

MUSCLE SHOALS, ALA.

I enjoy your magazine, especially since it is bigger now. For those of us who work with angles and degrees, please check *Three Projects You'll Want To Make* (page 112, Jan. '75). In *Pier Curia Shelf*, the angle at the top left drawing should read $93\frac{1}{2}^\circ$. Also the angle in the left middle of the page should read $86\frac{1}{2}^\circ$ which would make it lean in $3\frac{1}{2}^\circ$.

LINTON COWART

VIDOR, TEX.

We said the new size would be easier to read—and it also seems the larger drawings make it easier for readers to catch our errors.

Okay—we told you so

If you will look into the November issue of PM back in 1966 you will find on page 142 a wonderful article entitled *Now We Are Mining Oil From Mountains* by Joseph N. Bell.

PM ought to be getting all the miles and miles of publicity that "I told you so nine years ago" entitles you to.

BERNARD B. SCOFIELD

BELLE HARBOR, N.Y.

The technique of recovering oil from shale is still being developed, but, unfortunately, is more expensive than, say, bringing in oil from Alaska's North Slope. (The oil deposits up there, of course, had not yet been discovered back in 1966). ★ ★ ★

Isn't this too much tire to turn down?

1. The Proven Gas Saver This is the tire that earned the name *Gas Saver*. When run at steady highway speeds against our original equipment belted bias tire, it saved up to thirty miles per tankful, important savings at today's gas prices.

2. 7 Day Test Ride and Handling Warranty

We're so sure you'll like the smooth ride and quick, positive handling of the Steel Radial 500™ that you can buy them, drive on them for seven days, and get every cent back if there's anything you don't like. Does any other tire company offer you that?

3. 40,000 Mile Warranty

If the Steel Radial 500 doesn't give you 40,000 miles of normal passenger use on the same car, any Firestone Store or participating Dealer will give you a new one, charging you only for the mileage received plus Federal Excise Tax. A small service charge may be added.

4. New Water Squeezer Tread

Firestone's amazing new Water Squeezer Tread actually pushes water out the sides of the tread to help keep water from getting between the rubber and the road. And the big, wide, Steel Radial 500 footprint puts a lot of tread under you to help hold tight to wet pavement.*

5. Steel Between You and Tire Trouble

Two belts of steel cord under the new Water Squeezer Tread help protect your tires from chuckholes and roadjunk* that you can't always steer around. They also hold the tread firmly to cut down on "tire squirm" that causes wear.

*** Don't forget - the safety of your tires is also affected by air pressure, wear, load, and operating conditions.**



New Firestone 40,000 mile Steel Radial 500



THE BICYCLE SHOP

BY EUGENE A. SLOANE

Living with a click

Our derailleur-equipped bicycles have Sun Tour GT derailleurs. When we coast, our freewheel makes a "clicking" noise. I have been told I have to live with this noise.—W.E. Duff, Norman, Okla.

True, you have to live with a clicking sound from freewheels. The click is built into the freewheel, and without this sound you would have a rear gear cluster that would freewheel in both directions; i.e., your cranks would spin but the bike would stay still. The reason: freewheels have a set of pawls that permit you to pedal, but when you coast let the rear wheel "freewheel."

The clicking sound you hear is the noise of the pawls sliding over the inside pawl flats of the freewheel. Better freewheels have two sets of pawls, and hence are a little noisier. These pawls can "hang-up" if clogged

by a little dirt or thick oil, which is why you should only use very light oil (no. 5 SAE or lighter) to lubricate both sides of the freewheel, and clean the freewheel by dunking it in kerosene every few months.

If you get stuck on the road and can't remove the freewheel that's hung up, try pouring kerosene or gasoline (careful!) into it, tapping the freewheel to dislodge the particle and relubing. Don't get any solvent or oil on tire.

Unsafe stopper

I am having trouble stopping with the "safety" levers that came with my bicycle. These are the extra set of brake levers that are located under the handlebars. How do I adjust these levers so they will stop safely? —Al Black, New York.

Glad you put quotes around "safety" as I have. These extra levers



(photo) are anything but safe, and in fact are quite dangerous. They have much less travel distance than conventional brake levers, and can butt right up to the handlebars and still not pull caliper brakes tight enough to stop safely in an emergency. Trouble is you get used to using these "safety" levers because they're easier to reach, and you get by until you have to come to a panic stop and find you can't. These extra levers work reasonably well *only* if wheels

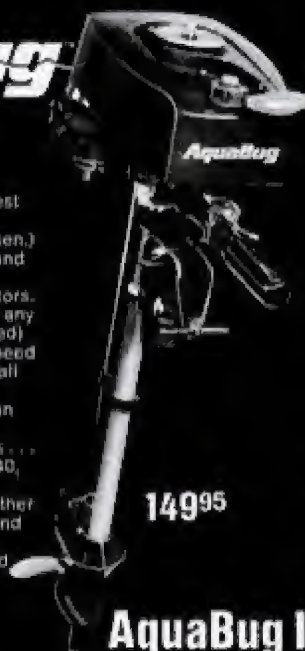
AquaBug

The 11 lb. Tranquillizer.
Add water and say
ahhhhhhhhhh!

AquaBug, the world's lightest outboard... still 11 pounds, still \$149.95. (Only the mighty have risen.) An AquaBug is 13 pounds lighter and \$70 less costly than Evinrude or Johnson's 24 pound, \$220 2 HP motors. More power per pound than any small outboard. (SuperBug excepted) an AquaBug is exactly what you need for a canoe, dink, inflatable, or small sailboat.

AquaBug burns less fuel than any outboard, and runs from 7500 RPM's to a rock-steady 650 RPM's... a superb trolling motor. (And no \$40, 40 lb. battery!)

Our brochure has facts no other company publishes, such as fuel and thrust charts. Which, of course, are the two most vital things you'd want to know.



14995

SuperBug

Lighter than a 2,
As fast as a 4!

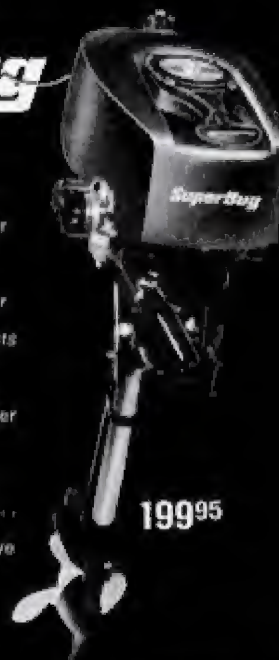
Presenting a new triumph... SuperBug. Only 16 pounds, and \$199.95, it can match 4 HP motors for speed... and blow them out of the water on weight, price, and fuel consumption.

SuperBug is 14 pounds lighter and \$135.00 less costly than OMC's 4 HP motors, it even weighs and costs less than their 2 HP motors... and is 40% faster!

It's got everything the obese outboards have, except the fat. Roller bearing smooth, built for ocean use, it's an astonishing outboard motor.

Need more power than an AquaBug?... SuperBug just sailed into your life. (Especially if you sail... 2000 lb. boats are no problem.)

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are true, if the brake block is no more than $\frac{1}{8}$ inch from the wheel rim (which can only be done if rim is straight).

Best way to "adjust" these hazardous levers is to remove them. Remove bolt on inside of lever (photo), remove washers and safety lever. Hacksaw off the lever axle flush with the brake housing, cut off about $\frac{3}{16}$ inch from axle bolt, reinstall the bolt. Or buy a shorter axle from bike shop. Use a brake hood over brakes for comfort when gripping brakes. You can buy hoods to fit your brakes from any good bike store.

Tubular vs wired-on tires

Are tubular tires, the kind that are sewn up all the way around their inside circumference, so very puncturable that a thorn would even puncture it? Can they be ridden on dirt roads? And where can I get the Corsa Strada or the new Japanese lightweight wired-on tires in my area?—Roman Kujdych, Vineland, N.J.

Tubular tires (photo above right) are generally lighter and thinner than wired-on tires, even the new "cheaters" or Corsa Strada tires you mention. However, some tubulars are more prone to puncture than others. For example, the $4\frac{1}{2}$ -ounce Vittoria Pistard Silk, designed for racing on

a concrete track, is extremely prone to puncture. At the other end of the scale, the 16-ounce D'Allesandro Worthy, used for training and for touring, is almost as impervious to flats as the light Corsa Strada wired-on tire. I have toured extensively on 9 and 10-ounce silk tubular tires with no problems. But I would not advise anyone but an experienced cyclist to do so.

For general touring I recommend the Corsa Strada or the Japanese



equivalent lightweight wired-on, which with tube weighs about 18 ounces, about 25 percent less than the conventional wired-on 27 x $1\frac{1}{4}$ -inch tire. You can buy the Corsa Strada at Raleigh dealers, the Japanese tire at any good bike store. Oh yes, a thorn can puncture any bike tire. If you plan to ride in Arizona, you will need special heavy thorn-resistant tubes.

Like a sack of potatoes

I would like to replace my 46-tooth front chainwheel with a three-speed transmission for wider gear ratios on my bike which is now equipped with a Sturmey-Archer three-speed hub. Can the SA hub take the extra load when the new unit is in low gear?—F. H. Mangelo, Baltimore.

Probably, but why bother? First, you will add at least five pounds of unneeded weight to an already heavy bicycle. Second, you will spend upwards of \$30 and several hours simply to make a heavy bike harder to pedal. Any gear ratio advantage would be largely offset by adding weight. Heft a five-pound sack of sugar, potatoes or the like. Visualize that pressure as fingers in your belt pulling you back as you climb a hill. I suggest you sell your three-speed and get an inexpensive 10-speed.

Where can I get decals?

Where can I buy decals for my bicycle? I recently painted it, and I need to replace them.—Hector Garcia, Guadalajara, Jalisco, Mexico.

Unfortunately, most bike makers do not routinely make decals available. You can get Schwinn and Raleigh through dealers; for others you may have to write to the maker.

★★★

Here's how Bart Starr feels about his favorite chain saw...the STIHL 015 *Automatic*



Like most professionals I go for super performance and top quality in the products that I use. That's why I go for STIHL!

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Visit your local STIHL dealer and ask him to show you what this little STIHL 015 automatic can do . . . and get a free autographed picture of me.



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Have your own money-making business and make the kind of income you probably thought impossible. You can when you clean carpeting or upholstery or walls with Von Schrader professional cleaning equipment. Every home, every building are potential customers. And every customer can become repeat business. The demand for on-location cleaning is growing so fast that how much you earn depends solely on just your time and effort.

Moreover, we help you every step of the way . . . just as we have helped thousands of others build money-making businesses for 40 years. Typical comments: "Cleaning is a very good business—have been most grateful for your advice and help. You have fine machines—can recommend them to anyone."—R. Herbst. "Never have we made this good a living and been so

content and happy."—N. Hanna. "Have all 3 machines and very pleased with each one."—C. Reiner. "You people sure helped me and I'll never forget it."—H. Kendall.

There are three easy-to-use Von Schrader machines. You need no special skills or education to operate them. (1) **CARPET DETERGER®**. Its performance cannot be duplicated by any other cleaning machine. (2) **UPHOLSTERY DETERGER®**. Using dry foam, cleans fabrics beautifully and safely. (3) **WALL DETERGER®**. Washes walls and ceilings 5 times faster than by hand—no dripping or streaking.

You can start with just one machine. Then, as your business keeps growing, you may want to add the other two and thus offer a complete cleaning service.

You pay no fees, royalties, sign no contracts. You own your equipment, the finest of its kind. Keep all you earn. And your investment is so small you may find it hard to believe. For complete information—without any obligation—send for booklet.

"Let me send you our free booklet that gives all the facts"

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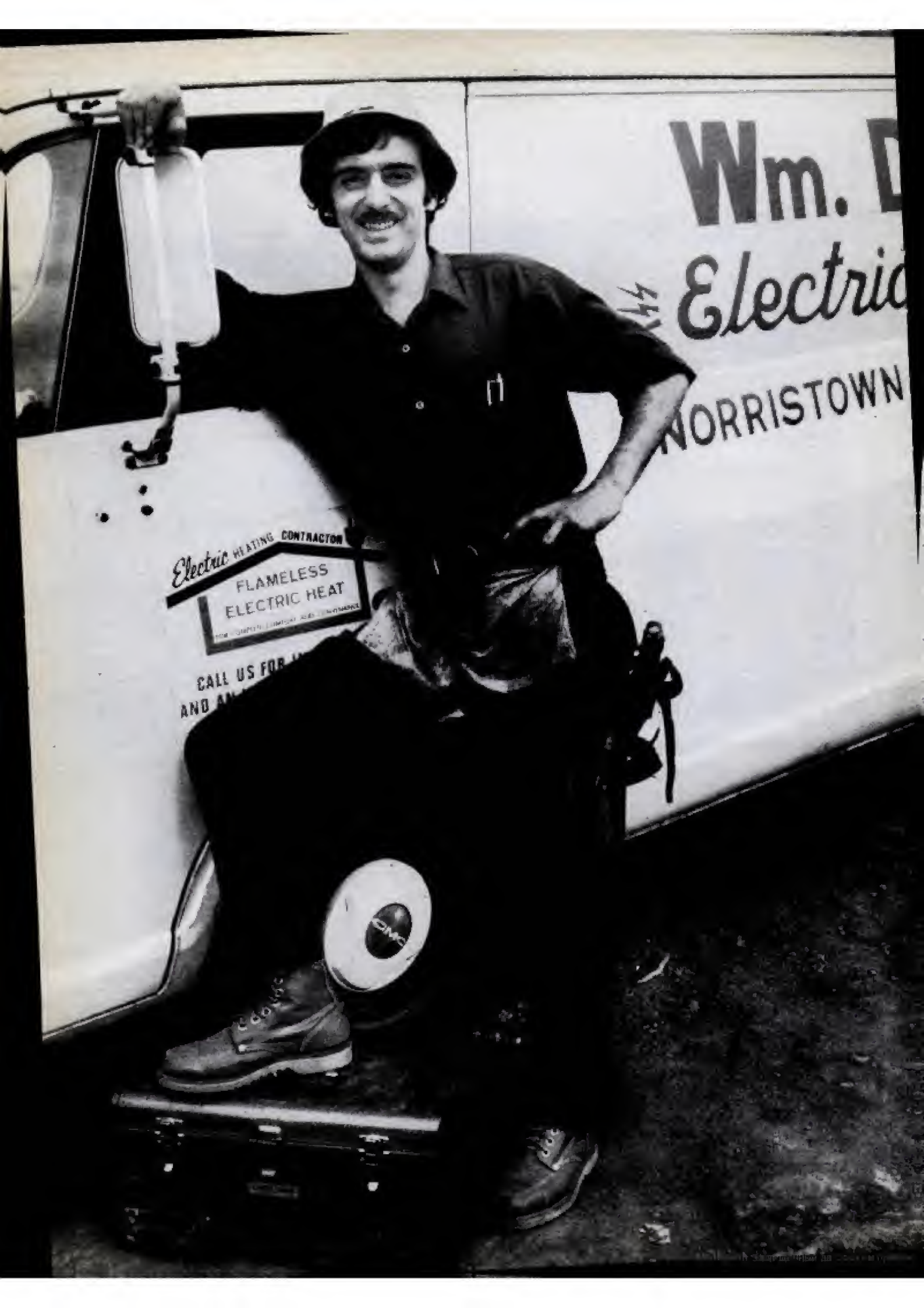
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IMPORTS AND MOTORSPORTS



More 1975 models

The year got off to a slow start, but by now all the '75 imports should be in dealer showrooms. Some cars were not introduced in time to be included in our '75 Imported Cars feature that begins on page 70 of this issue. So this month's column—written closer to press time—will make the roundup complete.

Triumph. Some purists wish British Leyland still made cars like the



TR7 wedge has high rear, low nose. Some jokingly call it "door-stop" styling.

TR2 and MGTC, but the traditional shapes of these sports cars have slowly evolved into the TR6 and MGB over the years. Now, with the introduction of the knife-nose TR7, wire wheels are gone forever.

The modern "wedge" is on an 85-inch wheelbase and is 164.5 inches overall. Height is 49.9 inches, width is 66.2 in. and turning circle is 29 feet. When I saw the car for the first time in Florida in January, I lost some of my ambivalence about its styling: it looks better in the metal than in pictures. It's a nicely scaled two-seater and it's carefully



TR7 interior is neat and well thought out.

assembled and finished. The roomy interior I found especially appealing.

Power is from the same two-liter, ohc, in-line Four used in the Dolomite Sprint (not imported here). It has more than enough punch for this size car, with 90 hp at 5000 rpm. The car does feel heavier than its 2300 pounds, however, mostly due to the steering effort required: I'd like to see power steering on this one. Still, you get hot-dog driving with fuel consumption in the 20 to 30-mpg range—that's like a free lunch. All you pay is \$5100. That, in case you haven't looked lately, puts you way ahead of the competition in dollars—and sense.

Aston Martin. The fate of the



'75 Aston Martin may be last of marque.

James Bondmobile still hangs in the balance—balance of the red and black on the books, that is. The British manufacturer may still be saved from bankruptcy. Some of the '75 V8s got into the country before the financial storm, and Rex Woodgate, who imports them, is optimis-



Subaru All Star is only 4wd station wagon.

tic about getting more of the \$32,000 cars. To get the latest information, write him at Aston Martin Lagonda, Inc., Box 358, King of Prussia, Pa. 19406.

Subaru. The six cars in Subaru's '75 model lineup are called Shooting Star, Evening Star, Super Star, Star Clipper, Star Cruiser and All Star, since Subaru is the Japanese name for the Pleiades group of six stars in the Taurus constellation. It all sounds a bit too cute, but the cars do have the guts to overcome their names.

Most intriguing of these cars is the



Mazda GTR is racy version of the RX-4.

All Star, which is the only four-wheel-drive station wagon you can buy.

Mazda. We found the RX-4 to be one of the hottest super coupes around (see *What, No Altimeter?* page 96, July '74), so it was natural for Mazda to give it a racy appearance. The result is the GTR—kind of a Wankel version of the late, great GTO. ★★★

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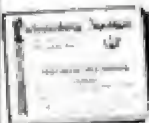
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New protection for new homes



The next home you buy may have something extra—a 10-year warranty against structural defects.

by Stephen Walton
ASSISTANT EDITOR,
HOME AND SHOP

Builders have something new to use to boost their new-home sales—and to keep you happy after you've bought. Its origins go back farther than today's slow market, but it could be just what is needed to start the turnaround, and it may be just what you've been waiting for.

It's a new kind of buyer protection called Home Owners Warranty (HOW). It's new—having been available for less than a year now. It's inexpensive for the peace of mind it can give—and it can even pay for itself. It's offered now in many areas, and should be available throughout the United States, in not too many years. It eliminates the risk of getting stuck with a shoddily built house. It works like this:

When you buy a home, HOW coverage is included in what you pay, at the rate of \$2 per \$1000 purchase price (minimum \$50). For a \$39,000 house, that's \$78, and you pay it only once. Actually, you may not be pay-

ing for it at all. It may be paying you, in effect, since at least one mortgage lending institution (and others may follow its lead) is offering interest-rate reductions of $\frac{1}{4}$ to $\frac{1}{4}$ of 1 percent on HOW homes. For that \$39,000 house, a $\frac{1}{4}$ -percent reduction would save you \$97.50 in interest payments, \$19.50 more than the cost of HOW coverage, the first year alone. Subsequent savings are pure gravy, of course.

Mortgage lenders like HOW for the same reason you're likely to—it means the house is a better bet. Protection begins when you take title or occupy the house (whichever happens first) and continues for 10 full years. It's transferable, too, so it can become a selling point for you if you move before 10 years are up.

Okay, but what's covered? The first year, the builder warrants that materials and construction in your home meet approved standards for your area. These standards are

usually based on local building codes, but in any event must be approved by national HOW. They deal with structural, mechanical, plumbing and electrical systems as well as quality standards. This first year's warranty, of course, also covers your home against structural defects.

Additionally, your builder will fulfill the terms of warranties issued by manufacturers of appliances, fixtures and equipment when the manufacturers cannot or will not fulfill them themselves (this protection is, however, limited in time to the duration of the manufacturers' warranties). Coverage includes the operation of plumbing, heating, cooling and electrical systems, with the limitation that components carrying manufacturers' warranties of less than one year are covered only for their own warranty periods.

In the second year, your builder warrants the overall performance of systems, except when problems result from the failure of individual components. Coverage still includes defects caused by work that does not comply with approved standards—this could include faulty work, for example, on piping, septic tanks, wiring, ductwork or refrigerant lines. If structural defects show up during the second year, they, too, are covered.

In the third through tenth years, coverage is limited to structural defects and is provided by HOW's insurance carrier, not your builder. That's great, you say, but what if my builder goes broke—as they sometimes do—before the third year. Doesn't that leave me high and dry?

No, it doesn't. One of the provisions of HOW's national insurance plan is that the insurance company takes over your builder's responsibilities if he can't or won't fulfill them during those first two years.

All right, but what's a structural defect and what isn't? The Home Owners Warranty Corp. puts it this way: "A Major Construction Defect is defined as actual damage to the load-bearing portion of the home, including damage due to subsidence [sinking], expansion or lateral movement of the soil (excluding movement caused by flood and earthquake)—which affects its load-bearing function and which vitally affects or is imminently likely to affect use of the home for residential purposes."

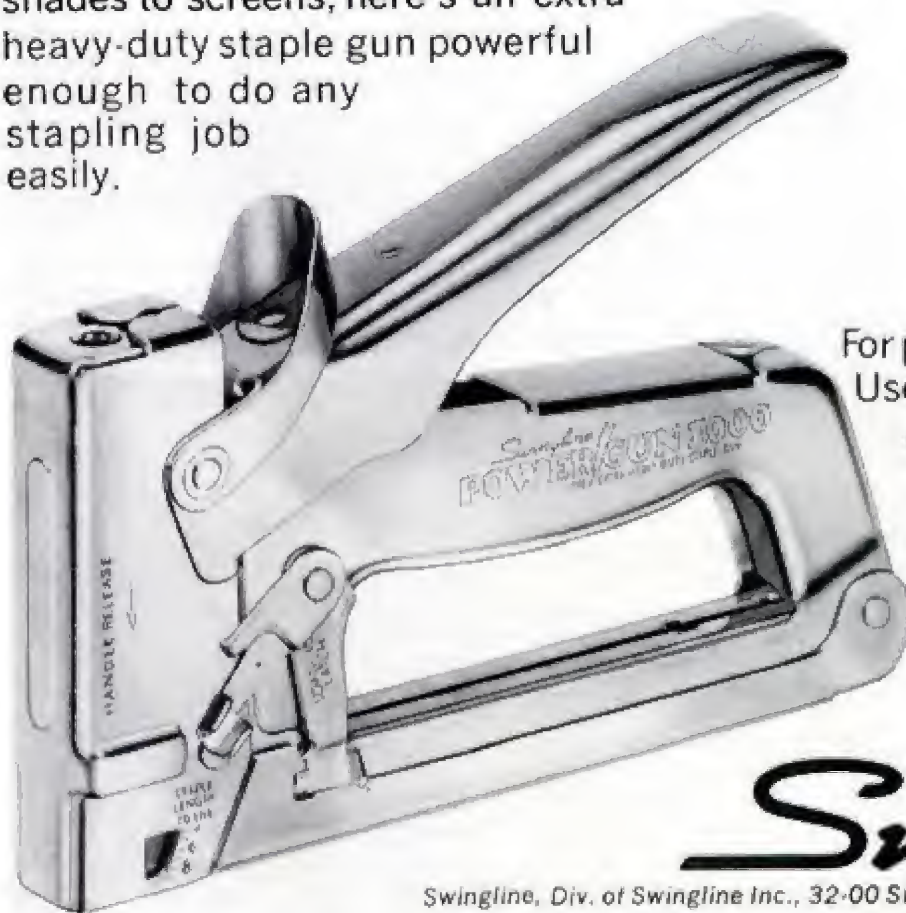
Got that? HOW Corp., in its consumer information booklet, goes on to cite as examples damage to structural elements of the home due to:

- Subsidence caused by ground movement.
- Subsidence caused by faulty work-

(Please turn to page 32)

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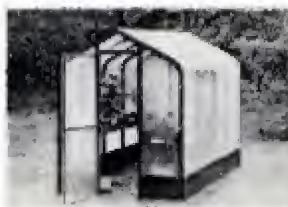


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NEW PROTECTION FOR HOMES

(Continued from page 30)

manship; e.g., building on badly compacted fill.

- Subsidence caused by bad soil conditions; i.e., weak or compressible soils, or expansive soils.

- Failure of beams, lintels, load-bearing walls or other superstructural elements.

- Excessive deflection or collapse of suspended floors.

- Inadequate structural roof members.

HOW Corp. gives these examples of problems that would not be considered structural defects—but that could be covered under first-year materials and workmanship provisions:

- Plastering, wall tiling, flooring and other finishes.

- Drains and services.

- Wet rot in window frames, doors, door frames and other millwork.

- Leaking roof and gutters.

- External items; e.g., boundary walls, retaining walls not necessary for structural stability of the home.

- Dampness in floors and walls.

What happens when a defect does appear? In the first and second years, you notify your builder in writing, and he corrects it. Sure, but what if

you and he disagree as to the validity of your complaint? Then either you or he may ask the local Home Owners Warranty council—the group that runs the HOW program in your area—to act as mediator, meeting with you and your builder to try to reach an understanding that will resolve the problem. The party requesting conciliation is required to put up a \$25 deposit. This sum is intended to prevent frivolous and nuisance complaints (which could increase the cost of HOW for future home buyers) and is refunded if the complaint is found to have substantial merit.

If conciliation fails to solve the problem, there's a further step—binding arbitration by the American Arbitration Assn., which has adopted rules especially for HOW use. The Home Warranty Agreement you and your builder sign stipulates that you both will recognize the arbitrator's judgment as final, and the arbitration procedure is faster and cheaper than going to court. It requires that the complaining party post a \$75 fee, all or part of which may be refunded, depending on the case's merits.

If an arbitrator rules against your builder but he fails to comply with the ruling within 60 days, the local HOW council will have the defects

fixed through the HOW insurance carrier—and the builder may be thrown out of the program.

If you can't reach your builder and suspect he's gone out of business, you notify the local HOW council in writing. It will investigate and have the defect corrected through the insurance company. In this case, there is a \$50 deductible—you pay the first \$50 of the total cost of claims during this two-year period.

After the second year, your builder is not involved. If a structural defect appears, you notify the local council, it investigates and, if the claim is valid, has the defect corrected, with the insurance company paying the cost. If you disagree with the decision on your claim's validity, you can go to arbitration—binding on the council and the insurer.

What are your obligations as a buyer of a HOW home? Very few. As explained in the Home Warranty Agreement, you must "keep and maintain the Home in good repair and condition," meet manufacturers' warranty conditions (except those concerning installation—they're up to the builder) and report defects promptly in writing. Signing the agreement does not take away any rights you have under the law, and you and your builder can still make any other contracts that will not alter his warranty obligations. And, as noted earlier, if anything is left of the 10 years when you sell your home, it is transferable to the next owner.

Dollar-value of claims is limited to the original selling price of the home. "Home" is very much the right word, by the way, because coverage is not confined to single-family houses—town houses and condominiums up to four stories tall are eligible. Coverage for high-rise condominiums will probably be offered soon.

What may be the most surprising thing to some about HOW is that it started with the builders themselves, not with the government or consumer activists. If it works as it's supposed to—and it looks as though it will—it will be an outstanding example of the kind of industry self-regulation that's often given lip-service but rarely becomes reality. Initiative for HOW came from the National Assn. of Home Builders, which had been watching with interest a similar program in Great Britain that proved extremely successful—now covering more than 99 percent of new homes built there.

NAHB set up Home Owners Warranty Corp., American Bankers Insurance Co. of Florida was chosen as the insurance carrier, and the first HOW-covered home was sold last

August. As of Feb. 1, 1975, more than 5000 homes were enrolled in the plan.

"We wanted to come up with a program that would be of real benefit to the consumer, and at the same time be very workable for the builder," says John W. Biasucci, HOW Corp. president. He explains that HOW is meant to be much more than a public-relations gesture or a way to boost people's willingness to buy during a difficult period. "We're trying to raise the general practices and standards in the housing industry itself to the highest professional level that we can. We recognize that there are homes that are not perfect, but we can still try to have the highest level of customer satisfaction, given that this is the most important purchase most people make."

An additional goal of the HOW program, Biasucci says, is "trying to develop dialogue between buyers and builders with the conciliation-arbitration process. Many problems are the result of not having brought things out on the table and talked them out."

Although HOW is NAHB's creation, participation is not limited to NAHB-member builders. "It had to be open to be effective," Biasucci says. Builders who wish to join the program are admitted or refused by the local councils on the basis of ethical conduct, financial responsibility and quality of their work. Those who are refused may appeal their cases to the national HOW organization. Registration is only for a year at a time, so that each builder is given an annual review.

With anticipated growth and increasing consumer awareness of HOW, Biasucci sees it improving competition among builders, "in the sense that a builder's willingness to back his product will become very visible, and builders not willing to back their product will be at a competitive disadvantage. They will have to drop out of the way or change their ways. If you're in this program, you've got to measure up. If you're not in it, consumers are going to start asking why."

The question of on-site inspections will be "up to the local councils," according to Quentin Wells, HOW Corp.'s vice-president of operations. "If they decide that the code inspection is adequate and thorough, they may have very few spot checks. If the code is not being enforced or if there is no code, then inspections will be done by HOW." Inspectors, Wells says, will be drawn from a panel used by the Veterans Administration.

Biasucci notes that HOW "could lead to the enactment of codes in areas that don't have them." This is



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not the only spinoff benefit likely to come from the program. "We're going to have a vast data source that's never been obtained before in the housing market," he adds. "We will get a lot of information on the defects that show up, and perhaps on products or systems that have higher defect rates than others."

This leads to the possibility of co-operation with makers of materials fixtures and appliances. "By having builders join together to improve their own industry, we think we will find manufacturers who will want to work with us. We want to be broader

than just the warranty of the builder—we're interested in the warranties that go with the house."

With no lack of optimism, Biasucci says he expects HOW to match the success of its British model, without the help that program got when mortgage lenders made it mandatory and Parliament gave it official backing. HOW has, however, been endorsed by Virginia H. Knauer, the President's special assistant for consumer affairs, and banks and savings and loan associations are looking with greater favor on buyers of HOW homes than on buyers of unbacked houses.

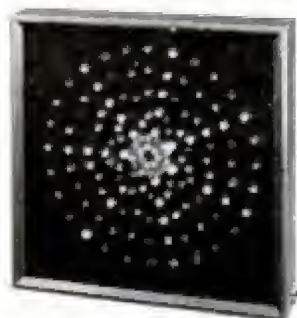
The entire program seems to be thoroughly thought out, containing nothing to make the potential buyer anything but confident. Even the standard HOW documents are reassuring—there's no fine print, and the language is unusually clear for legalese. With insurance-commission approval granted in 28 states and with more on the way, it shouldn't be long before an active national program is a reality. Meanwhile, there's evidence that there must be something to it—the HOW builders are selling homes. For more information, write HOW Corp., National Housing Center, 15th and M Sts. N.W., Washington, D.C. 20005. ★ ★ ★

Green lights for HOW

As of Feb. 6, 1975, the following states had given the clearance needed for HOW's insurance coverage to be offered:

| | |
|------------|---------------|
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| Alaska | Montana |
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| Colorado | New Hampshire |
| Delaware | New Mexico |
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"Kaleidoscopic" light show you hang on a wall. 4 filters separate sound into 4 bands; each controls 35 brilliantly colored lights — red for bass, blue for low midrange, green for upper midrange, amber for treble — 140 lights in all, pulsating in time to music of your hi-fi. Wide 25 db dynamic range; great for any type of music. Walnut-grain vinyl-clad case, 23" x 23" x 4 1/2". On/off/sensitivity control.

Kit TD-1006 \$79.95*



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Professional performance at a budget price. 26 ranges resolve voltages to 100 μ V, currents to 100 nA, measures AC & DC current up to 2 A, resistance from 100 to 1000K ohms. Big, bright 3 1/2-digit readout with automatic over-range & polarity indications. Built-in reference standards for easy field calibration. With rechargeable batteries & AC line cord.

Kit IM-2202 \$179.95*



NEW DC-10MHz Oscilloscope

A great scope—a great value! Perfect for TV servicing. 10 mV vertical input sensitivity, time bases from 200 ms/cm to 200 ns/cm, internal or external digital triggering, two input channels. Mu-metal shielded tube with 8x10 cm graticule.

Kit IO-4530 \$299.95*



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Kit IM-5210 \$17.95*
Assembled SM-5210 \$24.95*



NEW

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Highly visible amber flash warns other drivers when your car stalls or breaks down. Non-marring magnetic base, 12' cord, plug fits cigarette lighter. For 12 VDC.

Kit GD-1026 \$29.95*



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Kit CH-1068 \$14.95*



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Electronic digital clock with standby battery power to keep time (without display) during power interruptions, electronic "beep" alarm with adjustable volume, 5 μ V FM sensitivity, quality sound. Less batteries.

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GR-500

Simulated TV pictures



GR-300



GR-400

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Advanced Heath engineering and outstanding picture quality. All feature on-screen channel readout & optional plug-in clock modules. In-line picture tubes with slotted shadow masks provide exceptionally bright, sharp pictures. In the GR-400 and 500, black matrix tubes improve contrast. And here's something new—static toroid yoke & magnet assemblies never require convergence & fixed LC filters eliminate instrument IF alignment. GR-300 & 400 come with walnut veneer cabinets; cabinets for the GR-500 start at \$39.95.*

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Kit GRA-2000-1, Digital Clock Module \$29.95*



GR-2000

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Highly Acclaimed GR-2000 Digital-Design Color TV

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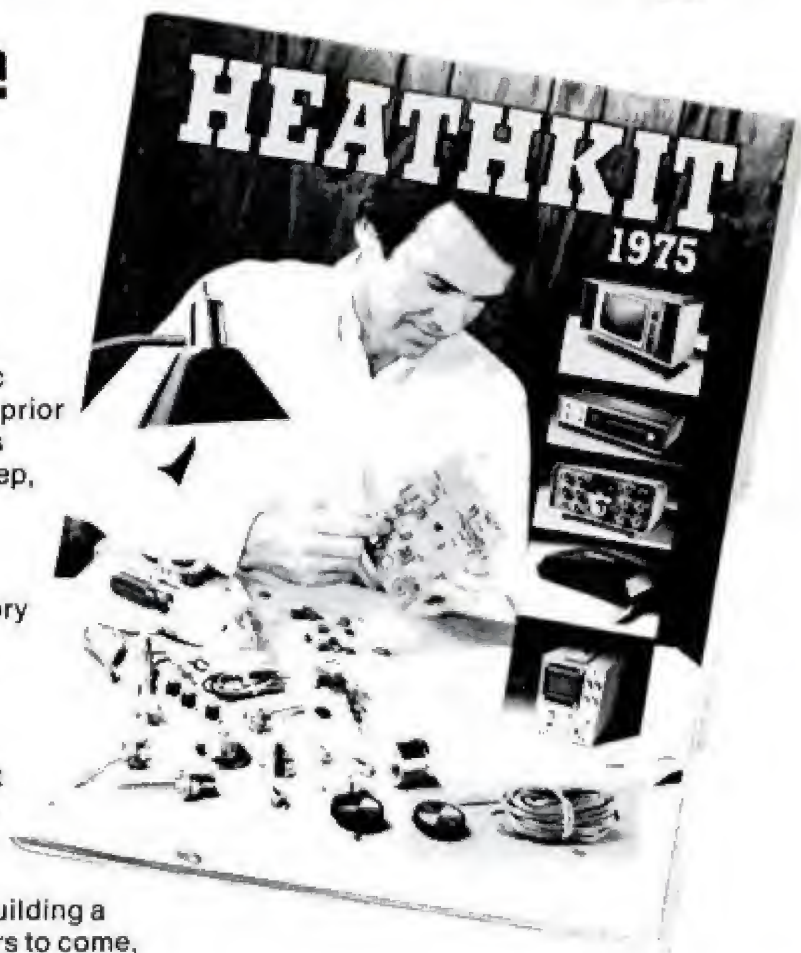
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BY MORT SCHULTZ

CAR CLINIC

Vega oil loss

In the October, 1974, *Car Clinic*, I advised Vega owners experiencing a drastic loss of oil because of cylinder-wall scoring that a special letter from Chevrolet to dealers had said that Chevy would stand behind all repairs on Vegas having less than 50,000 miles. Some readers wrote and said that their dealers had told them I was all wet. Based on the experience of the following reader, I would say that the reverse is true:

"I had just about given up on my 1971 Vega with 47,000 miles, which had been using almost as much oil as gasoline since the 20,000-mile mark, when I read the October issue. I took the article to my Chevy dealer. The first man I spoke with told me that you didn't know what you were talking about, and that my car had no warranty coverage after 12,000 miles. I then spoke to the service manager and told him I would take the conflict right to GM and let them resolve it. With that, he admitted that he had received the special letter you had spoken about, and I was told that he would install a new engine in my car at no charge. I don't know how to thank PM enough, but you can bet I will be a subscriber for the rest of my life."—Max C. Douglas, Lake Park, Fla.

Thanks, Max. The rest of you Vega owners who have met stubborn dealers—hang in there.

Bowlegged Pinto

My 1974 Pinto Squire station wagon (2300-cc engine) has 10,000 miles and a waddling problem. When I apply the brake hard, the left front brake grabs before the right front, pulling the car to the left, and I also get a shimmy up through the steering wheel. When I apply the brake gently, all I get is the steering-wheel shimmy. What do you say is wrong?—Mike Schuh, Everett, Wash.

I say that the disc-brake rotors have probably developed nonuniform thicknesses. Both should be checked with a micrometer. The variation should not exceed .0005 in., and the thickness of each rotor should not be less than the minimum safe thickness shown on the rotor. If rotors

still meet these qualifications, but are not uniform, they may be made uniform by cutting them on a disc-brake lathe.

Afraid to sit

The plastic along the seam of the driver's seat in my 1969 Rambler two-door is splitting. Nothing I use holds, and no store we've gone to has covers. The car must last me for two more years. Please help.—H.T. Frost, Milwaukee

American Motors doesn't make covers, and a few telephone calls to stores in my area failed to reveal a company that does. The only thing I can suggest is that you take the car to an automobile seat cover-top upholstery shop and ask to have a patch fashioned and sewn on. But if you must have a set of seat covers, I'm sure that the shop could make them for you.

Tire topics

I know I shouldn't use radial tires on a car with conventional tires. But: (1) can steel-belted radials be used on the same car with cord-belted radials; (2) can belted-bias tires be used on the same car with plain bias tires?—J. Elwood Long, Oley, Pa.

"Yes" to both questions. You can use steel-belted and cord-belted radials on the same car, and belted-bias and plain bias on the same car. However, for maximum stability, see to it that the same kind of tire is used on the same axle. For example, use steel-belted radials on the front axle and cord-belted radials on the rear, or vice versa. Use belted-bias on the front axle and plain bias on the rear, or vice versa.

Searching high and low

I have a 1971 Volkswagen Squareback with fuel injection. I rely on a vacuum gauge when doing tune-ups, but I can't find a place to hook up my gauge. Local dealers haven't been able to help. Can you?—Gordon H. Williams, North Miami, Fla.

Place a "Tee" connector in the

pressure-sensor vacuum line and attach your vacuum gauge. The pressure sensor is on the left-hand side of the engine compartment near the coil.

Or, if the engine is warm, find the auxiliary air regulator, which is bolted to the crankcase right near the distributor. Disconnect the vacuum line that goes to the intake manifold at the air regulator and plug the vacuum gauge into its end.

Face lift

My 1971 Ford LTD is a classy car, except for the vinyl top. My son took the car to a car wash, and they used hot wax on it. Since then, the top has been a mess. It looks chalky white. Is there anything I can use to clean it?—J.M. Praitte, Bridgeport, Pa.

Go to a Ford dealer and buy a can of Ford's Vinyl Hardtop Cleaner and Reconditioner (part No. C8AZ-19F-5353B). Apply the product with a soft-bristle brush to restore the vinyl's top coat and prevent further discoloration. Do not use a household scouring powder or a hard scrub brush; these would destroy the top coat.

Cop-out

My 1974 Pontiac Luxury LeMans constantly stalls and/or hesitates when the engine is cold. This has happened while I'm trying to get into the flow of traffic, even when the car is warmed up for five minutes. My dealer has had the car seven times and now tells me the condition is normal and nothing can be done to fix it. His reason: "All the pollution-control equipment." If he is right, I regret ever buying the car.—Gary Taibbi, Sound Beach, N.Y.

Your trouble could stem from one of several problems. None are related to emissions control equipment, but all can be checked by a good diagnostician. You may have a faulty accelerator pump in the carburetor, the choke may need readjustment, the float level may need adjustment to specification or the fast idle may be releasing too soon. Don't fall for the

(Please turn to page 40)

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Kings, 16 mg. "tar," 1.1 mg. nicotine; Longs, 17 mg. "tar," 1.2 mg. nicotine, av. per cigarette, FTC Report Oct. '74

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CAR CLINIC

(Continued from page 38)

bull about it being the fault of air-pollution equipment. That just is not so, and if the dealer can't satisfy you, get him to call the Pontiac regional zone office and get a factory field representative out to you. I have a no-nonsense message that came direct from Pontiac regarding your problem:

"This owner's problem can be corrected."

SERVICE TIPS

■ **Code for better service.** A code of responsible automotive servicing practices has been adopted by the National Institute for Automotive Service Excellence, which is urging that it be adopted widely by service organizations "to assure high standards in automotive service and repairs."

We publish the code here, so that you will know what to expect from your mechanic if he adopts its provisions:

1. Customers should be offered an estimate of cost in advance of services to be rendered.

2. Customers should be promptly notified if service appointments or completion promises cannot be kept.

3. Repairs should be authorized in writing by the customer except when other arrangements have been made to the customer's satisfaction. Prior to commencement of repair, customers should be given the opportunity to request an inspection of the removed parts.

4. A written, itemized invoice for all parts, labor, and any other charges should be given and explained to the customer upon completion of the work. This invoice should clearly identify any parts which are used or remanufactured.

5. Customers should be provided with a written copy of any guarantee covering repair services.

6. Appropriate customer records of services performed and materials used should be maintained by the service company for at least one year.

7. Service employee pay plans should not be such as to work to the detriment of the customer.

8. Service businesses should make reasonable provisions to protect the customer's property while it is in their custody.

9. Service businesses should have stated policies and procedures for customer relations and any complaints should receive full and fair reconciliation.

10. Service businesses should cooperate with customer protection agencies to pursue satisfactory resolution of customer inquiries. ★ ★ ★

GOT A PROBLEM WITH YOUR CAR?

Just ask Mort about it. Send your question to the Car Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. While letters cannot be answered individually, problems that are of general interest will be published in the column.

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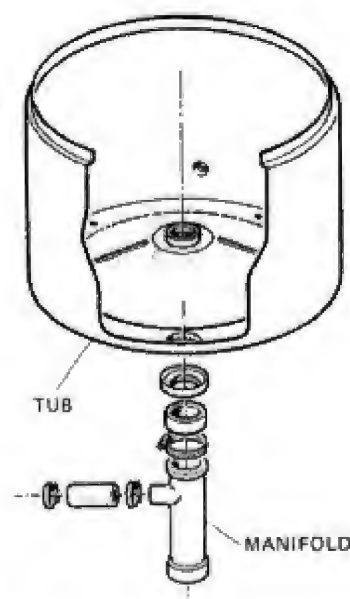
Look for the Gabriel "Buy 3-Get 1 Free!" sign where you service your car. Offer ends May 31, 1975.



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APPLIANCE CLINIC

BY PAUL MANN



Washer perplexity

My 1960 RCA Whirlpool Imperial clothes washer (Model W6104700) poses a problem. Water drains properly after the wash cycle, but the water that enters the tub during the spin cycle remains after the cycle has been completed. I find the tub partially filled with water? Why is this? —M.P. DeCruyenaere, Santa Ana, Calif.

It's a matter of pressure. With the tub full of water, enough pressure is being exerted during the drain period after the wash cycle to overcome the obstruction I think may be in the manifold (also called the pump guard).

The manifold is a pipe approximately 8 in. long, usually made of plastic, on the bottom of the tub. Water is pumped through it from the tub to the drain line. In time, it can be plugged with lint and small objects like coins and pins, so that water will not flow out unless it has pressure behind it. Water injected into the tub for the spin cycle produces little pressure, apparently not enough to overcome the manifold obstruction, because its quantity is only four quarts (four one-quart spray rinses). With insufficient pressure to overcome the obstacle, water remains in the tub.

If my diagnosis is correct, the situation calls for disconnecting and cleaning out the manifold. Turn off the water and disconnect power. You will probably have to tilt the ma-

chine to get at the manifold connections. The illustration at the left should help.

Pooped out

I have a rechargeable electric toothbrush that has run down. Does the battery ever get so bad that it will not take a charge? If so, how long does it usually last? Is it possible to get a refill or must I buy a whole new appliance?—Wesley L. Adams, Laconia, N.H.

Batteries do in time fail and aren't capable of taking a charge. I've seen some units that have been running 10 years and others that had to be replaced after one year. There is no refill battery. You have to replace the appliance or the power handle, depending on the model, because these are sealed and their integrity should not be violated.

Most electric toothbrush manufacturers have an exchange policy allowing you to buy a new unit at a relatively low price.

Possibly your problem may not be caused by a bad battery but by a malfunctioning charging base—but I'd say the odds against this are 100 to 1.

Deicing a dehumidifier

I have a 20-gallon Sears dehumidifier in my basement that I try to keep set on "normal." But the coils ice over. Yet when I set the unit midway between "normal" and "off," no ice forms. What's wrong?—Robert N. Goldsmith, Bellefontaine, Ohio.

Probably nothing. When coils ice over, it usually means that the temperature in the part of the house where the dehumidifier is located is too low for the humidistat setting. A dehumidifier will not run at higher settings without coils icing, if the temperature is below 70° F. At lower settings, the unit is shut off for longer periods of time, allowing coils to defrost.

Obviously, you have to find the setting best suited to temperature in the basement; it will probably vary with the season. In summer, when you're more likely to need a dehu-

midifier, basement temperature may exceed 70° F., so the setting can be adjusted for longer running.

Fittful dishwasher

My Hotpoint dishwasher, Model 20DA35E, is giving me fits. It pumps in water intermittently only for two or three seconds at a time, and will not move to the next setting in the cycle. I checked the timer and the points look good. The motor works. Can you help?—K.C. Wu, Westminster, Calif.

You cannot determine the condition of a timer just by looking at it, and from your description I would have to say the timer is probably at fault. But let's do some checking to be sure.

An incoming-water problem of this kind can be caused by a malfunctioning water solenoid, bad pressure switch or bad timer. I suspect the timer because of your cycling problem, but to be certain remove the bottom access panel and place a voltmeter across the terminals of the water solenoid. Turn the unit on. The voltmeter should show power and the solenoid should allow water to be pumped in for from 60 to 90 seconds. If water is shut off sooner but power is not interrupted, the solenoid is faulty.

If power is interrupted, suspect the pressure switch or timer. The switch keeps the unit from being overfilled; it includes a rubber diaphragm that can eventually get stiff and make the water act strangely. If the meter shows a power interruption, replace the pressure switch; you can't be sure it has gone bad, but it's cheaper than the timer. You'll find it in a metal housing about the size of a 50-cent piece in the bottom of the tub.

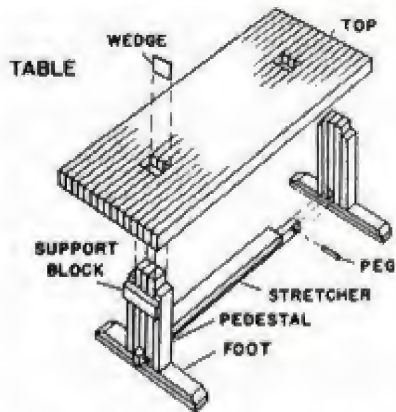
If the unit still fails to operate as it should, replace the timer—it's the only thing left. ★★★

If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N. Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

Stanley gives you more of a hammer. Free plans prove it.

Is a hammer just a hammer? No way! Take this butcher-block table for instance, where you've got a lot of 8 penny nails to drive in. Your arm will tell you, right away, that you'd better use a quality hammer – a Stanley.

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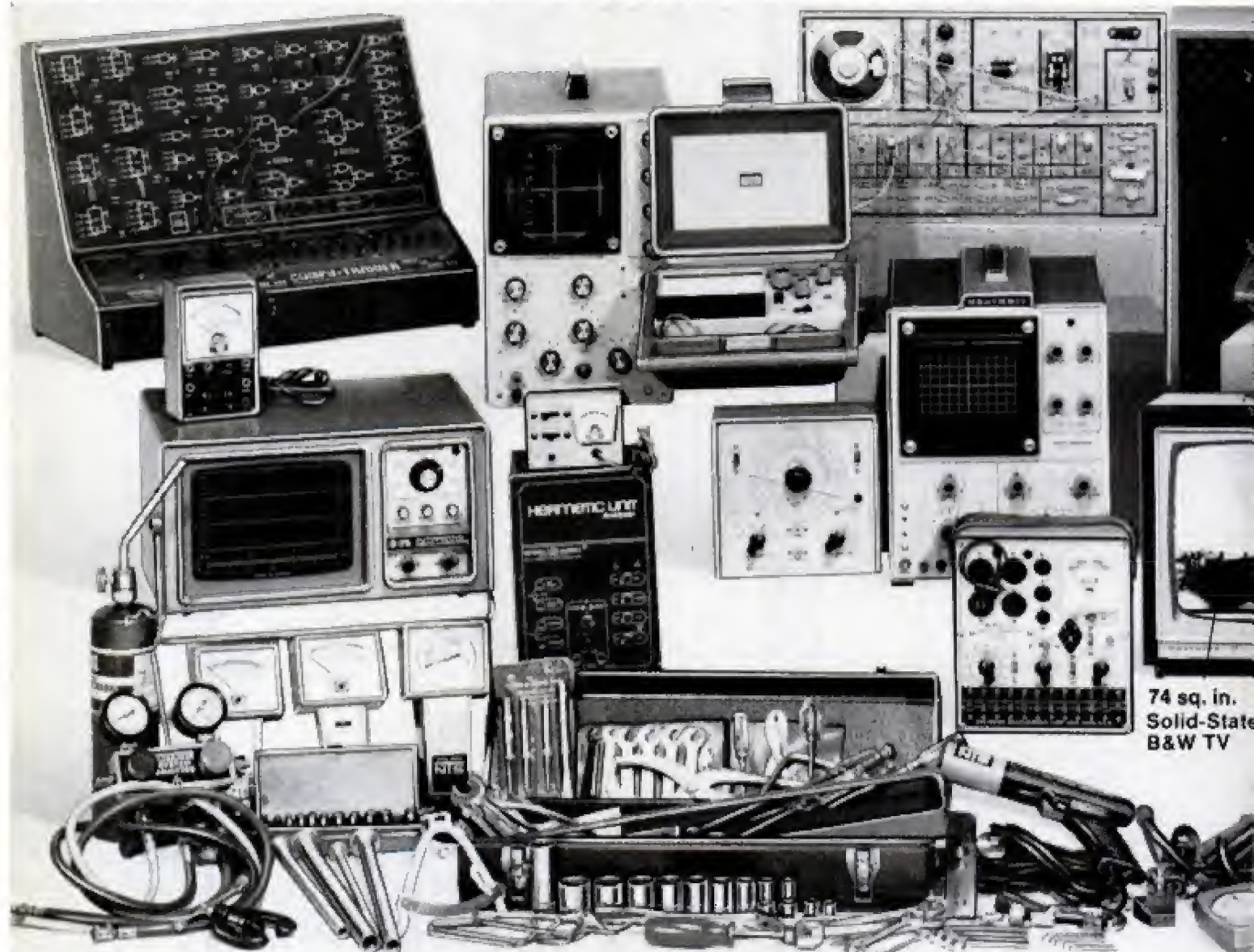


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QUESTIONS ANSWERED BY W. CLYDE LAMMEY

HOMEOWNERS' CLINIC



Covering a bathroom wall

I want to paper my bathroom floor to ceiling on four walls and from tile to ceiling over the shower stall. The bath is small; 3 feet wide and only 8 feet the long way, with an 8-foot ceiling. Now I'm told that paper will make so small a room look even smaller and will deteriorate quickly. What do you say?—Mrs. J. N. Carney, Lincoln, Neb.

I tend to agree with your advisers—especially where a small-figured, busy pattern is concerned—but this is not to say that paper should not be used. Judging from the size of the room, I think it would be better to paper only three walls and paint the wall above the shower, or perhaps paper just one wall.

Your wall-coverings dealer will recommend the type of coated paper or fabric to use. Wash, rinse and dry the walls thoroughly before you apply it.

Paint tubs if you must

Can I paint my basement laundry tubs, inside and out? If I can, what paint should I use?—Miles Proctor, New York.

You can paint them, but wouldn't a thorough cleaning do as well? Laundry tubs are virtually impregnated with soapy residues, and preparing them for painting will take some cleaning—repeated scrubbing with a strong detergent solution. If you must paint, do a really thorough cleaning job first. Otherwise, there's no way.

Epoxy enamel is the only finish you can expect to last under such adverse conditions, and I'd recommend the aerosol type. Wear rubber gloves when cleaning and a painter's respirator when spraying, and be sure to turn off all gas pilot lights (furnace, water heater, dryer) first.

Accelerated oxidizing

I have a jardiniere which I'm told is copper, and I'd like to color it that greenish verdigris, as I believe it's called. How can I do this in a hurry, without waiting for it to form

naturally?—Hal Worden, Sioux City, Iowa.

If the jardiniere has value as an antique, I'd leave it as it is. If not, you can get something approaching natural coloring using a mild oxalic-acid solution. Clean the copper, then make a solution by dropping a couple of average-size oxalic-acid crystals into a gallon of water in a ceramic container.

Caution: Don't pour water on the crystals. Wear rubber gloves and eye protection. Use a cotton swab to apply the solution. After half an hour to an hour, rinse with clear water. When the metal is dry, the color should be uniform if you've been careful not to skip any areas.

Closed vs. open sump

I have a minor water problem in my basement and my plumber proposes to install a closed sump; that is, a tile set on, or in, a concrete bottom. He says an open-bottom sump will cause the pump to run almost continuously. What is your opinion?—M. Wheeler, Cleveland.

Your plumber is better able to advise you than I, at such long range. He is thinking, no doubt, that the water table in your locality varies, perhaps with the seasons, but may seldom be entirely below the level of the proposed sump. If the sump has the open bottom and is on a gravel or sand stratum, your pump would tend to run more or less continuously.

I must assume, of course, that only storm water will enter the sump—that is, water seeping to subsurface levels. In the type of installation proposed, the pump would operate only when water seeping into the basement enters the sump.

In dry periods, the sump must be kept clean by occasional flushing; it should be tightly covered. ★★★

Do you have a home maintenance or repair problem? Send it to Homeowners Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.45 postpaid. Send orders to PM, Dept. HD5, Box 1014, New York, N.Y. 10019.

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WITH BILL McKEOWN



Swifter sails

For a lot of sailors, like this one, who have tried to trim and tune just a little more zing out of a Sunfish, it's good news that AMF Alcort is now offering an optional Marconi rig. Available for the smaller Minifish as well, the conversion includes a sleeved loose-footed 75-square-foot sail using three battens, black anodized two-piece mast, four-part main sheet that secures with a cam cleat (a real improvement over holding with your teeth). You also get sophisticated



AMF Minifish and Sunfish take speed rigs.

bigger-boat niceties like outhaul, Cunningham downhaul, vang, mid-boom connection for the main sheet and a deck traveler as well. You can make like a Finn, Laser, or Force 5 skipper for about \$325 for the new sail rig.

But there's also an extra that most sleeve sailjobs don't have. With both Minifish and Sunfish Marconi conversions, the unstayed mast fits up through the luff slot of the sail. To put up and, especially, to take down the sail, however, you don't have to unstep your mast. The sail can be raised and lowered with a halyard—no need for a panic session at dockside, offshore if a squall comes up, or if you take a knockdown and want to

lower sail while you right the boat again. This way it's easier (and less embarrassing) to handle.

The Sunfish is the largest one-design class there is, and our prediction is that you'll soon be seeing a lot of these conversion rigs around.

Getting the lead out

While more pressure is being put on duck hunters along some flyways to use steel rather than lead shot to cut down lead poisoning of ducks that eat spent pellets, Winchester-Western, leader in lead-versus-steel shot studies, reports encouraging results with sintered pellets. This Canadian development compresses powdered lead and steel together.

The result is a load much less toxic than lead but with long range and less possibility of barrel damage than with steel.

Winchester and other companies make both lead pellet and steel pellet shotgun shells; it's just a matter of determining the best answer to a problem. Sintered shot may be a good compromise. We'll keep you posted on developments.

Getting the lead in

Graphite, that is; the "lead" in lead pencils. Graphite's carbon fibers have been found to offer more strength and lighter weight. They also have an ability to dampen out needless vibrations when bonded into the shaft for a golf club, fishing rod or tennis racket.

Shakespeare, with its Graflite rods, and Fenwick, offering HMG



Trabert racket joins graphite rods, clubs.

(high modulus graphite) rods have been leaders in this new field. With prices up to \$150 a rod, they won't be the choice for all of us, but they provide remarkable action. That all-around perfectionist sportman Ted Williams tells me he is impressed with models he has tested, though as yet no rod carries his name in the Sears line.

Guarantees graphite products now carry indicate that makers are overcoming a rumored tendency of graphite shafts to become brittle with age. Now, if someone could just bring down the price of graphite gear—and everything else. . . .

Gearing up

One way to land that lunker more quickly is to reel the line in faster, and we're seeing new bait-casting rigs that can buzz a lure across the surface so fast a bass will simply strike for spite.



Daiwa Millionaire sports 5-to-1 gear ratio.

Garcia has announced a big game Ambassador trolling reel with quick takedown design for easy maintenance, lever-shift drag control and 3.4-to-1 retrieve ratio. From Sears, the Ted Williams M/540 line-leader features 3.56-to-1 retrieve. Heddon's latest, the Mark 3200 Free Spool, is reported to get a cast out farthest by releasing both gear train and level wind, and then get it back fast with a 4.1-to-1 ratio. And the Daiwa High Speed Millionaire 5H and 3H claim fast retrieve honors at a geared up rate of five spins of the reel for one crank of the handle.

Recall to shore

Many people have read about the recall of defective cars but don't know there is a similar program for

(Please turn to page 52)

Evinrude 75

It does a lot of things- very, very efficiently.



Once in a generation, a motor comes along that seems to do everything right. The Evinrude 75 (with its companion 70) is such a motor.

Probably no motor ever made has such a wide, wide range of efficient use.

It's small enough and light enough for fast 15-16 footers. Big enough for many 18-20 footers. Strong enough to push a barge, or tow a tournament-class skier at tournament speed. Fast enough to set records in its class. Smooth enough to troll by the hour at dead slow speed.

No motor we know of surpasses its economy,

horsepower for horsepower, boat for boat, mile for mile.

The Evinrude 75 is the original loop-charged Evinrude. The first with pulse-tuned exhaust, pressure-backed piston rings, pressure-temperature controlled cooling, and breakerless solid-state ignition and solid-state generation. And this year, it introduces Finger-Tip tilting.

It develops its 75 horsepower from just 49.6 cubic inches of displacement, which says something for its efficiency.

Evinrude 75. The performance motor with saving ways.

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ALL OUTDOORS

(Continued from page 50)

boats administered by the Coast Guard. Automotive problems get plenty of coverage in the papers, but pleasure-craft corrections do not find their way into print.

Fortunately, according to the Coast Guard, the corrections required so far are mostly minor and have been taken care of quickly by the manufacturers involved. The most frequent complaint has been the lack of horsepower, maximum weight and persons-capacity certification and the small plaque that is supposed to be mounted somewhere on the boat to give you these specifications. Insufficient flotation has also been charged against some models. A few outboard motors have needed stronger throttle return springs and other small replacements.

Boat and motor makers have been quick to notify owners, if possible, and make the necessary repairs. Many boatmen, however, fail to fill out warranty cards when they buy a boat or motor, or register with the builder when they get a used model. Manufacturers want to protect their reputations with prompt adjustments, but there isn't much they can do when they can't locate the products.

If you suspect you have a defect problem, or hear a report that your boat or motor model is included in a recall campaign, the Coast Guard tells me you can get information by writing Dept. GBBC/3, U.S. Coast Guard, Washington, D.C. 20590.

Travel trends

Taking a trip, and sometimes camping along the way, looks like a popular and inexpensive way to vacation on a budget this year. A recent survey by Kampgrounds of America, the big KOA camp chain, indicates that three-quarters of the people they questioned will spend at least two weeks camping this year, although many of them will spend weekends near home.

Bargain group trips are available through American Youth Hostels, Delaplane, Va. 22025, and not all of them are aboard a bicycle. They also have backpack hiking, train, floatboat and station-wagon tours in this country and abroad, and "youth," they explain means young at heart. A free booklet, *Highroad to Adventure*, is available on request. Hostels have recently been established in several national parks.

Learning a sport skill while traveling is another way to go. Sailing and mountaineering are popular ex-

amples. Graduates of the Offshore Sailing School, headquartered at 820 Second Ave., New York, can join the Sail Away Club at the same address and take part in group cruises. Recent ones have included Greece and the Virgin Islands. Individuals and families can hike the mountains around Vail, Colo., this summer by contacting the National Hiking and Ski Touring Assn., Box 7421, Colorado Springs, Colo.

Practical preservers

No life preserver or PFD ("personal flotation device" as the Coast Guard insists on calling them) is going to do you any good if you don't wear it when you need it. So a trend we particularly applaud is the introduc-



Gentex preserver has flotation in comfort.

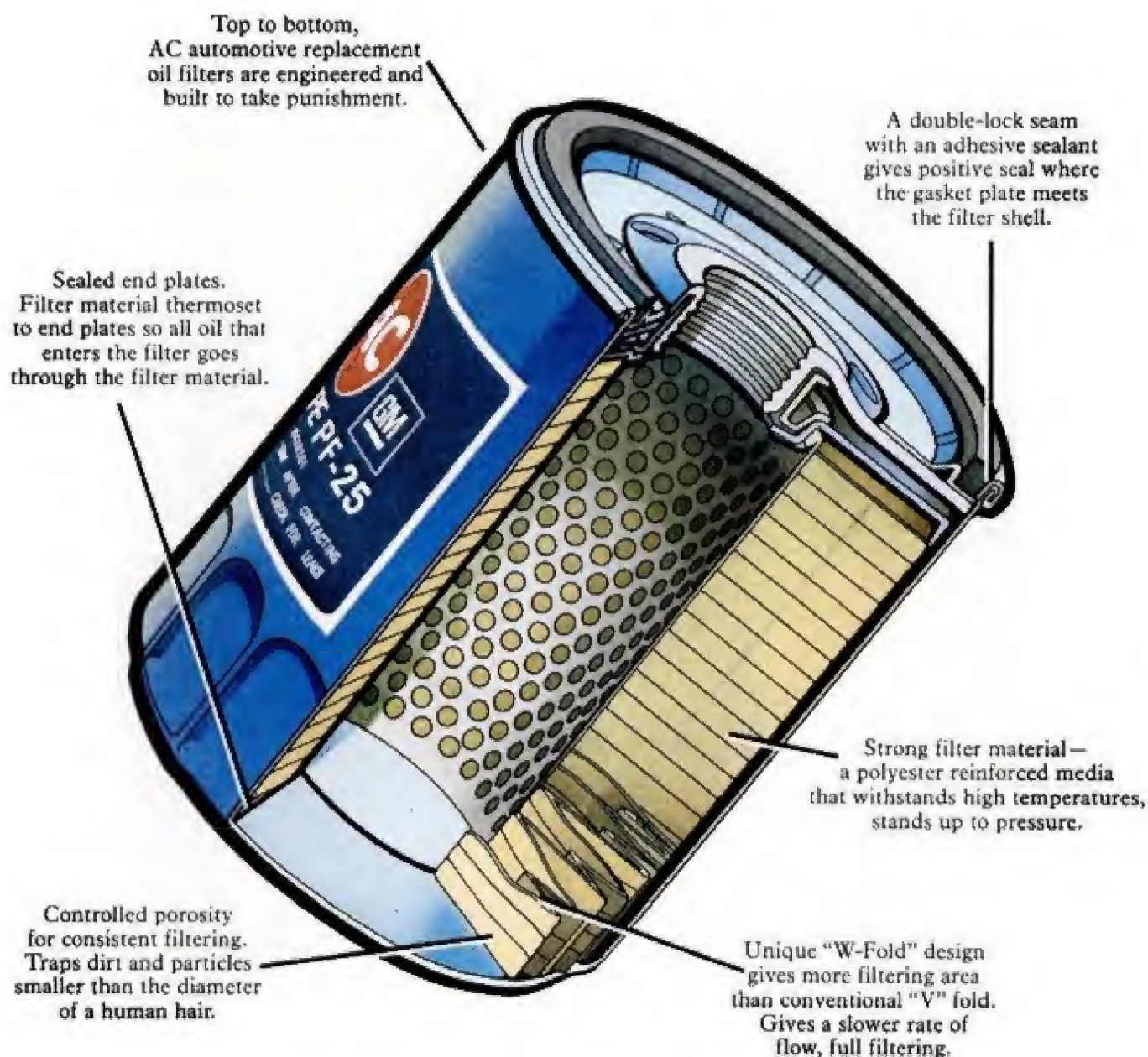
tion of more windbreaker-type jackets that have flotation inside and are finally receiving Coast Guard approval.

Good looking and loose enough for active sports, the jackets are made primarily for sailors, but are equally useful for fishermen, waterfowl hunters and anyone who will be around the water. They are now available in a variety of colors, including international orange and camouflaged hunter olive.

These jackets are quite expensive—about \$40 to \$60 for the ones we've seen. But that really isn't much to pay when one could keep you afloat and alive. Stearns, Gentex (shown here), America's Cup, MidShip from MidWest and a number of other

(Please turn to page 54)

Have an engine worth protecting? Look into an AC Oil Filter.



Why AC Oil Filters? Because we build a lot of engine protection into our compact blue cans.

And while we're on the subject of engine protection, we might offer this thought. You may be making fewer and shorter trips these days to conserve fuel. Unfortunately that can keep your engine from getting hot enough to burn off the condensation that forms in your crankcase. Condensation that when mixed with certain contaminants can form acid that can rob you of protection. So as recommended in your

owner's manual, when it comes to changing your oil and oil filter it's wise to think months, not just miles.

And remember all the good things an AC Oil Filter gives you to help protect your investment.



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ALL OUTDOORS

(Continued from page 52)

companies now manufacture them. I prefer an oversize model that allows room for a heavy sweater underneath, and that has a pocket to hold one of the new little waterproof emergency strobe marker lights. Honeywell is pricing its new Strobe-lite at about \$20, and there are several additional makes around to choose from.

Tent tips

The latest development in tents is toward fire-retardant fabrics. Some states already are requiring this feature, and many of the bargain tents we'll see for sale this year will be old models that are being unloaded because they don't have this feature. The chemicals necessary for fire-retarding tend to make tent fabric stiffer, heavier and more expensive—and these are factors which have slowed down the introduction of safer cloth.

Fire-retardant materials will still catch fire if held in a flame, but most campers know enough to keep the campfire, lantern and campstove well away from the tent. Youngsters don't however, and their tents particularly must be fire-retardant and have the rear exit that White Stag is introducing in some of its models. And the kids, of course, must be supervised to see that they don't try lighting candles or toasting marshmallows inside.

Equally important, but badly overlooked, is the fact that some synthetic fabrics and plastics are practically airtight. Usually, these are used with small backpack tents that only have room for one or two people. But if tents made with these fabrics are tightly closed up while several campers are inside during a cold or off-season outing, particularly with a "safe" catalytic heater inside as well, all of the oxygen could be used up and the occupants could suffocate before morning. The catalytics don't give off carbon monoxide, true, but they, and campers, consume oxygen.

A bad camping accident is likely to occur sometime to remind outdoorsmen of the importance of adequate ventilation.

Preview

Outdoors came indoors at the Astro-dome in Houston early this year, and we spotted a number of interesting new items at this annual National Sporting Goods Assn. preview of products for sport-shop dealers.

Gear that looked particularly good

we will be testing for in-use reports in a month or so. Meanwhile, here is a quick roundup of equipment new and different.

For underwater action, Shakespeare has announced the Scuba-Drive, an electric motor pack that fits on a diver's air tank to provide him with up to three miles an hour of subsurface speed. A hand-held Submobile tow pack will also be offered. The Farallon Multi-Tissue Decomputer is one of the new instruments that now can warn a diver when he is approaching the need for decompression. And AMF Swimaster has introduced the Aqualume I, a compact strobe light for underwater photography.

Archery and black powder muzzle loading are two sports that are experiencing a rapid growth. Commemorative replicas of old-time guns are being offered by a number of manufacturers.

Colt now has brought back single-action classics such as the Buntline Special with its 12-inch barrel and the percussion Dragoon and 1851 Navy.

Thompson/Center Arms, of Rochester, N.H., has a single-shot Contender pistol that is designed to take 23 interchangeable barrels, ranging from .22 up to .44 magnum with a choke arrangement for firing hot shot cartridges with a pattern which is equivalent to that of a .410 shot shell.

Or squeeze the grip of a Smith & Wesson or Colt fitted with a \$100 Nite-Site from Triple K Manufacturing in San Diego and a button is pressed that makes the sights suddenly glow in the dark.

Easier on the environment than scrounging for firewood around a campsite, the new tiny packstoves from a number of makers—Paulin, Gerry, Mountain Products, Zebeo, Trailblazer, Optimus and others—use convenient and compact LP gas containers for fuel.

Want more action, even after completing an all-day hike? From your specially fitted shoulder bag you can take out a new Moonlighter Frisbee from Wham-O that will glow in the dark.

To pay for all the new gear that's now available, you might need a gold mine, and even finding that is easier, too. From Garrett Electronics, Garland, Tex., you can order its new plastic "Gravity Trap" gold pan for \$3.95. It has ridges on the side called "built-in rifles" that are supposed to quickly pan out any nuggets that happen to be lying around. ★ ★ ★

Man-Size

ECONOMY TRACTOR

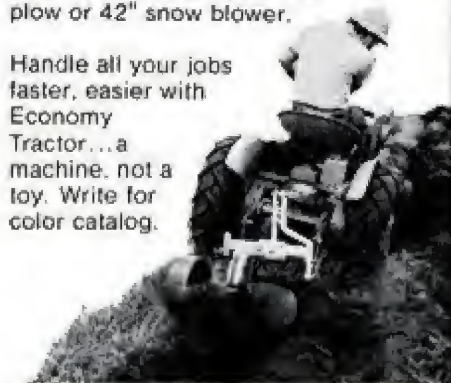
No-nonsense power for the busy gardener

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Now drive it . . . a tractor that's as rugged as the job is tough. Extra weight and traction for more push-and-pull power. Automatic all-gear drive converts nearly 100% horsepower to pure work-power . . . gets more work done per gallon of gas.

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Handle all your jobs faster, easier with Economy Tractor . . . a machine, not a toy. Write for color catalog.



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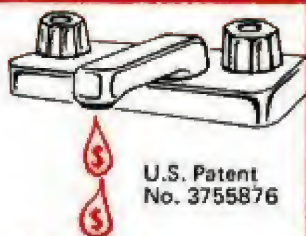
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NO PLUMBER — NO SPECIAL TOOLS — NO SPECIAL SKILLS

With our VULCAN UNIVERSAL FAUCET RESEATING KIT you can stop this sort of leak FOREVER. You get 8 universal valve seats made of high grade surgical stainless steel — the same 304SL stainless steel used in atomic reactors and submarines. Because of their strength and resistance to corrosion, we offer a no-time-limit money back guarantee. The installation tool which comes with the kit insures that the seats will fit perfectly any faucet that uses washers — because the Vulcan stainless seat mounts right in your old seat (you don't remove it).

These seats come with 8 matching non-expanding universal mated washers made of Delrin® — a material so tough it is used in making gears. With these washers you also end the annoyance of old fashion rubber washers that swell and cut off your hot water — usually right in the middle of washing your hands or during a shower.

HOW OUR KIT WORKS: A special hand tool cuts groove in your old faucet seat.

Delrin® washer is universal. Does not need to fill up washer holder. Does not need side support.



Surgical stainless steel seat held in groove with space age adhesive sealant.

If you follow the simple do-it-yourself illustrated instructions that are included with your kit, you can hardly go wrong. You can repair any standard faucet that uses a washer and seat — no matter what brand or age.

THE VULCAN KIT CONTAINS: 8 stainless seats, 8 mated Delrin® washers, installation tool, adhesive sealant, illustrated instructions and an Unconditional No-time-limit Money Back Guarantee. The price of the kit—enough to repair 8 single faucets is only \$7.45 Ppd.

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Send us a couple of old seats: we'll mount two Vulcan seats FREE as a demonstration.

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HINTS

FROM READERS

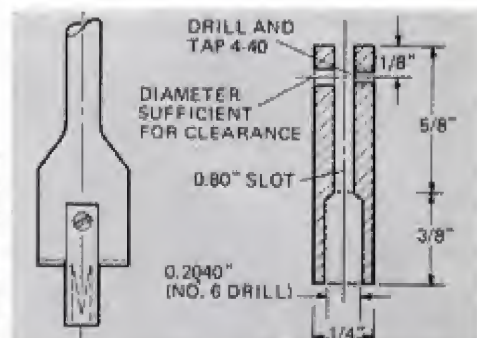


Easy enlarging of existing holes in sheet metal

The safest, easiest way to enlarge existing holes in thin sheet metal is with a tapered reamer, not a drill. It leaves the holes round and smooth; the slight taper of hole is usually not noticeable.—*Federico Strasser, Santiago, Chile*

Guide lets spade bits perform extra functions

A spade bit, used in a drill press with the pilot shown, cuts perfect holes in soft, thin materials like aluminum and brass, can also do counterboring and spot-facing. Drill a 1/4-in.-dia. hole through metal and backup, then use the bit operated at low speed.—*Hallan E. Goldstine, Port Jefferson, N.Y.*



Supply shelves on card table made possible by perforated board

A 2x2-ft. square of perforated hardboard, lashed with wire to the legs of a card table used as a drawing table, will keep the board uncluttered as it accepts hooks and shelves on both sides. Three sides of the table could receive this treatment.—*Grace B. Weinstein, Los Angeles, Calif.*



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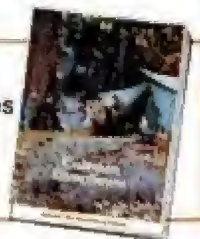
With a big weather-resistant, flame-resistant Coleman tent as your cabin. The easy-care comfort of washable sleeping bags. A cold-hugging Coleman cooler and jug. And the famous Coleman lantern and Coleman stove that you'll find on almost every campsite.

And having your own "Coleman Resort" means a lot more than one vacation. Because that red Coleman label on a product assures you of value that **lasts**. Coleman builds products that keep on going. Trip after trip. Year after year.

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44 Qt. Metal Cooler, matching 1-Gal. Jug inside.



WICHITA, KANSAS

PHOTO HINTS

FROM READERS



String safeguards safelight

If you use your bathroom as a darkroom, sooner or later the weight of your safelight may break your ceiling light fixture. So tape a loop of string around your safelight and hook the string over the fixture's shade screw. This extra support will keep the light fixture from bending or breaking.

—J.D. Maxwell, Vancouver, Wash.



Keeping test prints flat

It's always a good idea to make a small test print of the most important areas of a picture before wasting a large sheet of enlarging paper. Holding the small test print flat in the middle of a steel easel is easy with this simple gadget. It's merely a frame of plywood or several cardboard layers glued together, held down with magnets inserted in the

ends. Size of frame depends on the size of your test sheets—I made mine $3\frac{3}{4} \times 4$ inches. It's especially handy for color-print papers which must be placed on the easel in total darkness; even in the dark, it's easy to find the frame, tip up one edge, and slide the paper under it.

—Phillip Duclos, Mira Loma, Calif.



Pipe cleaners stop drips

Developer, fixer and other chemicals won't drip down your glass graduates to contaminate or mar your darkroom if you wrap a pipe cleaner (or two cleaners twisted end to end) around the glass to catch the drips.

—J.D. Maxwell, Vancouver, Wash.

The little Pocket that's quick as a wink.



The Pocket 40 is a clever little camera. In bright sunlight, its $1/225$ -second shutter speed can give you beautiful stop-action pictures. Its $f/8$, 3-element lens focuses as close as 3 feet.

Its CdS electric eye and automatic exposure control give you the right exposure for the right picture. It's less than \$73 for all that. Other Pockets start from less than \$25.

Prices are subject to change without notice.

Kodak pocket Instamatic® cameras.





CAPRICE ESTATE: PRACTICALITY PLUS LOWER MAINTENANCE COSTS.

Caprice Estate is clearly Chevrolet's finest wagon, offering room, comfort and style to help make family chores or recreational excursions more pleasurable. Power steering and brakes, an automatic transmission, and steel-belted radials are standard.

But in the '75 Caprice Estate with standard 400-4 V8 engine, there is also an important savings story to consider: lower recommended maintenance costs.

\$348 lower maintenance costs.

Let's compare our '74 and '75 models over a 50,000-mile period.

While parts and labor costs will vary throughout the country, we've used current list prices for parts and a figure of \$11 an hour for labor and found this: If you follow the Owner's Manual for recommended service, a 1975 Caprice Estate with 400-4 V8 using unleaded fuel could save you nearly \$350 in parts, lubricants and labor over a '74 model using leaded fuel.

Family-size comfort.

There's a satisfaction that comes with giving your family the finest. And Caprice Estate is Chevrolet's finest blend of wagon practicality and tasteful styling.

Outside there's opaque "Mozambique" vinyl wood-grain paneling.

And inside, automatic dome and courtesy lamp switches at all doors.

There's a special sound insulation package that includes roof padding over the cargo area and a thick underhood insulation blanket.

The available sport cloth interior in classic herringbone tweed (shown above) is a no-cost option.

Practicality wagon families like.

There are many Chevrolet wagon features you and your family will like.

The Glide-Away tailgate helps make loading easy, even in tight quarters. You don't even have to unhitch when unloading if you're trailering.

There's storage space behind the forward-facing third seat on 3-seat models. And the rear seats flip down easily from the right rear door.

Caprice Estate, part of the full line from Chevrolet, America's Family Station Wagon Builder.

**CHEVROLET
MAKES SENSE
FOR AMERICA**

Chevrolet

DETROIT LISTENING POST



BY ROBERT LUND

More small cars from GM

If GM can swing it, there will be two new small cars in dealer showrooms this year. One home-grown, one from Japan. GM has put its mini Chevrolet on a crash basis and as of the time this issue of PM went to press, chances of the car coming out in October were about 50-50.

The import is virtually a sure thing. It's the GM-Isuzu and is in production now. It's just a matter of turning out enough cars to begin volume shipments to the United States. Named Gemini, the car should start arriving at U.S. ports in August or September, just in time for the new model season. If there are enough cars to go around, Olds and Buick dealers are expected to get equal dibs at selling Gemini. But if supplies aren't adequate to cover both dealer groups, Buick is favored to get first crack.

How big is small?

GM competitors can hardly wait to get a gander at the mini Chev. Not to see what it looks like, but to put a tape measure to it. With all cars coming down in size, the other companies would like to know GM's new definition of big, medium and small before resizing their cars. They already know GM's new definition of big. It's the smaller Cadillac. Once they have the measurements of the mini, they can make a pretty accurate guess at how much GM will lop off its medium-sizers.

One group of GM mediums, the X-body cars—Nova, Omega, Ventura and Apollo—will get new sheet metal in the 1978 models, so they will be out in the fall of 1977.

GM, Ford eyeing no-frill cars

At least two auto companies, GM and Ford, have faced up to the fact they have priced a lot of people out of the new-car market. All that stuff about added value and content (translation: making accessories standard instead of optional), and how it takes the average wage-earner fewer paydays to purchase a '75 than it took to buy a '65 may sound good,

but those pitches never sold a nickel's worth of automobile.

GM and Ford are taking a serious look at producing basic-transportation, no-frill cars that could be sold for \$3000 or less. This would be a significant step back pricewise.

All the companies advertise '75 cars for under \$3000. But don't try to buy one. They don't exist. By the time you add tax, freight, dealer prep and a few other surprises buried in the small type, the price is over \$3000. Loaded jobs are over \$4000. What GM and Ford are after is a set of wheels you could drive out of any showroom in the continental United States for no more than three grand.

GM just (late February) took the first step and made some standard equipment optional in order to lower the base price of some models. By newsstand time, Ford (and maybe other makers) likely will have followed "price-leader" GM.

Long preview for Chrysler

You may have to wait as long as six months to see all of Chrysler's '76 cars. Here's the plan as of now: Most cars will come out in September. Changes will be minimal. Two months later, about November, the company will bring out a new Valiant/Dart under new names. New names because the present cars will be continued virtually unchanged from '75 versions. So there will be a new Valiant/Dart along with an old Valiant/Dart; the same thing Ford did with Maverick and its successor, Granada. Initially, the new Valiant/Dart will be limited to a two-door. Come next spring, a year from now, the two-door will be supplemented by a four-door and/or wagon. The wagon is still a question mark. The company is working on it, but not at a pace that would indicate it is pegged for early production.

Wankel remains on back burner

Chances of GM putting a rotary in a production car in the next few years are just about zilch. Even if pollution rules are relaxed, there are other problems with the Wankel en-

gine—at least the GM version. Fuel economy is only fair versus a piston engine and GM says there's still a lot of R & D work to be done in the areas of reliability, servicing and mass-production.

Air bag still a good bet

When are we going to get air bags? The talk right now is about bags being dropped. Carmakers say the crash cushions would cost \$250 to \$300—figures Detroit can document—and with the auto biz as bum as it is, they aren't about to sock on another increase. The government sympathizes with the industry and has softened its stance—not so far as to say, "Forget it, fellas," but it isn't applying pressure the way it used to.

Everybody—car companies included—agrees bags are a good idea. The hang-up is price. Detroit is stalling for time to get the price down and to improve reliability of the device. Say two years, three years. A source at GM, who would be called on the carpet if we used his name, says GM has put \$80 million into development of the air bag. Given another couple years and \$10 million more to put in the project, he thinks GM could install a front-seat bag in every car for just under \$100.

Packard fan foiled again

This is the time for auto shows and there's been a gang of them the past few weeks. I have a weird friend, name of Clarke Crandall, who is hooked on going to auto shows. But not to look at cars—he never gets much beyond the entrance.

Crandall's favorite car was, is and always will be Packard. He looks like a guy who would drive a Packard. Tall, distinguished and with a magnificent handlebar mustache. When Crandall goes to a show, he immediately seeks out someone of authority. "Kindly direct me to the Packard exhibit," he intones with a straight face, no indication that he is kidding. Man in charge takes a few seconds to recover and explain there is no Packard exhibit. Crandall registers surprise, does an about-face and departs. It's a funny bit. ★★

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PM'S PICK: The top 20 lures to catch the lunkers

These tackle-box winners could keep you in fish around the world.

by Buck Rogers and
Bill McKeown OUTDOORS EDITOR

Making a selection like this is nearly as dangerous as judging a small town's beautiful-baby contest. Someone's bound to be unhappy because we left out his favorite. We know an Argentine fishing guide, for instance, who's going to throw his hat in the air because we didn't list his old reliable trout lure. We expect a letter from at least one vociferous Canadian camp operator, and then there's a Texas fishing friend who probably won't speak to us for a year. But whether we're talking about "wimmin" or anglers, there's no way to please 'em all. Our selection here, however, ought to just about guarantee you good results almost anywhere in the world.

Our choices are based on experience stalking a wide variety of fish around the globe, plus recommendations from hundreds of other fishing authorities. Included among our lures are spinners, jigs, surface lures, spoons, shallow runners, deep runners, wobblers, wigglers and jerk baits—indeed a versatile collection. Among them are half-a-dozen best bass baits, several deadly trout lures, north-woods favorites for pike and walleye, hot smallmouth lures, artificials for panfish and lures that also take tarpon, snook and barracuda.

Wherever you go, for whatever species you fish, this selection of artificials should provide at least one lure which will do the trick. To aid in checking advantages of these individual lures and assist you later in filling a few voids in your tackle box, we have separated the group into functional categories.

Bass specials

We have a special category for these two lures because the largemouth is the most popular game fish in the United States. Sooner or later every angler will get acquainted with this species.

■ **Plastic worm:** Since the dawn of angling history, the night crawler has been the most effective bait a fisherman could string on a hook. It was only a question of time before

someone brought out an artificial worm, and Nick Creme did so in 1949. Since then, the plastic worm has become No. 1 bass lure. Most bass fishermen use it more than all others combined; many fish nothing else. Today, rigged and unrigged worms are made by a number of reputable companies. To prepare your own, impale a 5/0 hook in an eight-inch worm, bring the barb out 1/2 inch behind the head and draw the worm up around the hook's shank. Most anglers turn the barb and bury it in the worm to make it weedless. For casting weight, attach a bullet-shaped slip sinker to the leader.

When fishing, cast the worm out and let it settle to the bottom. With your rod tip high, reel in slowly and crawl the worm back over the bottom. When a bass picks it up, strike. If you miss repeatedly, use a delayed strike. Experiment. Worm fishing is a science that takes practice.

■ **Spinnerbait:** Another hot bass lure is a safety-pin device with lead body, hook and skirt on one wire and one or more spinner blades on the other. This weedless lure can be fished through heavy cover. Some anglers buzz it across shallows with the blade raising a water hump. Others work it over the bottom like a plastic worm. This relatively new bait, made by several firms, has earned a spot in most professional bassers' tackle boxes. The one we have selected for our color photo of life-size lures is the Bass Hog by Storm Manufacturing of Norman, Okla.

Topside teasers

The greatest thrill of angling is the surface strike. We always start with surface lures and only reluctantly change to underwater performers. Our three surface selections are an unbeatable combination; each is a great lure in its own right.

■ **Chugger:** We're not sure that this lure was in James Heddon's collection when he started the company in 1900, but it certainly gained fame shortly thereafter. This is a popper-type lure which does nothing on straight retrieve but performs a variety of tricks in the hands of an experienced angler. Chug it in water-scooping surface explosions, wiggle



Famous fisherman Rogers, proudly displaying an Amazon tucanare, joined the editors in naming the best baits.

it gently in one place, make it "walk the dog" in the frantic manner of an escaping fish. All these Chugger tricks tantalize bass, tease tarpon and produce strikes from every gamefish which will rise to a surface meal. This bait comes in a wide selection of patterns and colors, and is available almost everywhere.

■ **Jitterbug:** Made by the Fred Arbogast Co. of Akron, Ohio, this could be the most popular surface lure in angling history. Retrieved in a normal manner, it slowly crawls across the surface, gurgling and flinging spray. Worked as a surface popper, it responds to rod tip action like something alive. It takes bass, is one of the better surface lures for pike, and the smaller models are deadly for big trout at night. To take big bass in midsummer, go Jitterbugging in the shallows of your local lake late at night with the black 5/8-ounce model.

■ **Injured Minnow:** This famous lure with propellers fore and aft is made by Creek Chub Bait Co. of Garrett, Ind. Extremely versatile, it works well when the water is calm, and on a wind or rain-ruffled surface it's probably the best surface lure we know. It's a quality bait made of wood in various sizes, colors, finishes. Fish it along weed beds for bass and

(Color photos of 20 lures on the next two pages; text continues on page 151)

PM picks the



Mann's Lil' George



Creek Chub Injured Minnow



Bomber



Heddon's Chugger



Lazy Ike



Normark Rapala



Helin Flatfish



Sheldon's Mepps Spinner



Arbogast Jitterbug

Top 20 lures



L&S Mirrolure



Cordell Big O



Johnson Silver Minnow



Burke Jig-A-Do



Storm
Bass Hog Spinnerbait



Plastic R&D
Rebel



Zebco
Doll Fly



Heddon's Sonar



Creme Plastic Worm



Garcia Abu Reflex



Eppinger Dardevle

Fabulous phono cartridges: 4 channels and 50,000 Hz.

PM tests cartridges you need
to play the new
4-channel Quadradiscs

by Hans Fantel



Audio-Technica AT20SL

Photo: Benn Mitchell

The new four-channel records are causing a revolution in phonograph cartridge design. Just a few years ago, only exceptional phono cartridges could "read" recorded frequencies as high as 20,000 Hz—the average limit of good human hearing—and only exceptional records went that high.

Now, frequencies you can't hear—up to 50,000 Hz—are becoming common on some records, and the super-cartridges to pick up those frequencies are coming in a flood.

But why use frequencies you can't hear?

On the new four-channel "Quadradisc" records re-

corded with the CD-4 system (page 102, Sept. '72), these frequencies carry the different signals that eventually are used to sort out the front-channel signals from the rear ones. Matrix four-channel records (using the SQ or QS systems) encode their rear-channel signals differently, without high-frequency carriers—and without as much front-to-rear separation, either. And stereo discs, of course, with no rear channels, also need no carriers.

The cartridges tested for this report are among the first available for playing this new kind of disc—and they give superb results on stereo, as well. But, fine as

they are, they're also expensive: The nine models we tested (see chart, overleaf), range in price from \$65 to \$175, with a median price just under \$100 (though the one we liked best didn't cost that much).

So, should you now rush out and buy one of these supercartridges? The answer is yes—if you're setting up for CD-4 four-channel records now, or if you plan to switch your system to CD-4 in the near future and now need a new cartridge anyway. You might also consider one if you plan to buy CD-4 records now, to prevent the wear that a stereo stylus, which can't move fast enough to follow the high-frequency carrier modulations, will inflict on them. CD-4 records can theoretically be played quadratically after even 100 playings with a stereo cartridge, but how well depends on the carrier-

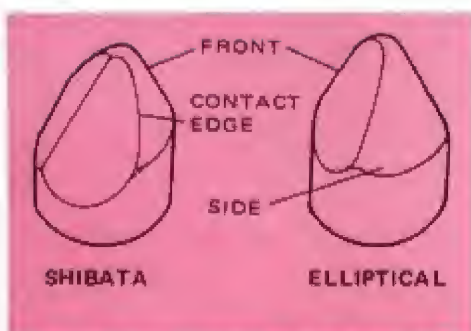
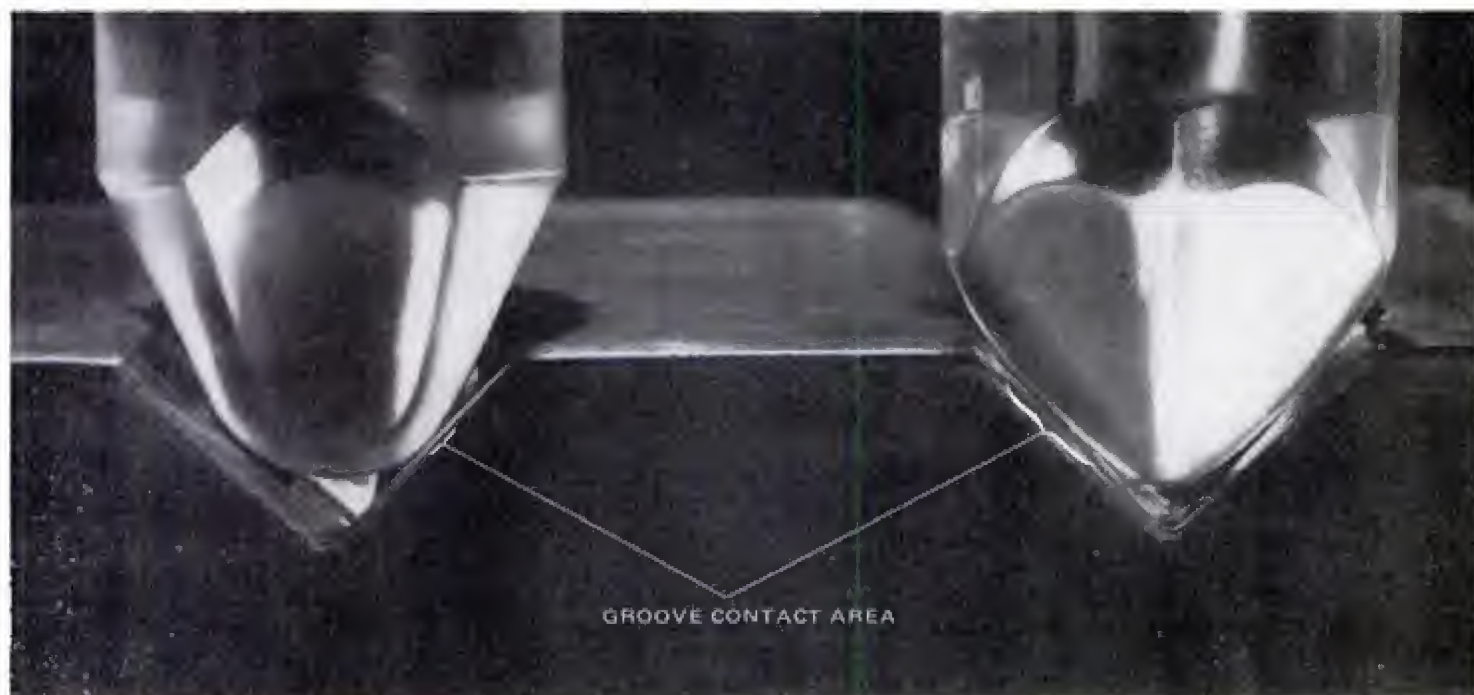
frequency response of the CD-4 cartridge and the sensitivity of the demodulator used to convert the cartridge's two output signals into four. Noise may increase and rear-channel separation decrease noticeably.

And if all you want is the best possible stereo sound, you should definitely consider the top CD-4 cartridges along with the top stereo models for sheer sound quality.

All this talk of "carriers" and "demodulators" is clearer if we explain how CD-4 works. Where matrix quadrasonic discs (like SQ and QS) mix both rear channels into each of the front channels, relying on minute differences in signal timing as clues for their eventual decoding into four signals again, CD-4 Quadradiscs are "discrete"—that is, they each contain four distinct signals, two on each wall of the groove.

That's where the demodulator comes in. This device strips the rear-channel audio information from the high-frequency carrier, transposes it back down into the audible range, then either adds it to the already audible front-rear sum signal to get a front channel, or subtracts it from the sum to get the rear-channel signal.

Such demodulators are built into many of the latest four-channel amplifiers and receivers (and a few turntables), but "outboard" demodulators to connect between your turntable and amplifier or receiver are also widely available. In some cases, you may need special, low-capacity cables between your turntable and demodulator to avoid carrier-frequency losses; but these are built into many modern turntables, and are often supplied with CD-4 demodula-



Multiradial styli like Shibata (above, left) or B&O's Pramanik (at right in photo) have smaller contact radii at the sides to trace Quadradiscs' tiny carrier modulations, but larger contact areas to allow higher tracking forces (see text).

One of these signals is an audible sum of front and rear channels (left-front plus left-rear on one side of the groove, right-front plus right-rear on the other).

Each groove wall contains, in addition to its front-plus-rear sum, a front-minus-rear difference signal—but you can't hear it. Using a trick invented years ago by telephone engineers to carry several conversations simultaneously on the same wire, CD-4 engineers superimpose the difference signals on a 30,000-Hz "carrier" frequency. In effect, the rear-channel difference information rides piggyback on the high-frequency carrier, far above the audible range. That's why the cartridge must respond to such high frequencies; add 15-kHz audio to the 30-kHz carrier to get a 45-kHz overall range.

tors or the components containing them.

CD-4 cartridges differ from the normal stereo models in their stylus shapes as well as in their frequency response curves. Unlike conventional stereo styli, which are either conical or oval, CD-4 styli take the shape of a three-sided, inverted pyramid with rounded edges.

Most such styli are called "Shibata" types, after their Japanese inventor, but other names (and slightly different shapes) also exist: "Pramanik," after the Bang & Olufsen stylus's designer, and "Quadrilateral" for the Pickering and Stanton design. Empire calls its version "four-dimensional."

Whatever you call it, this stylus tip is designed to present both a sharper radius (the better to trace the car-



ADC Super-XLM

Audio-Technica AT12S

Audio-Technica AT15S

Bang & Olufsen 6000



Empire 4000D/I

Empire 4000D/III

Panasonic 450C-II

Pickering UV-15/2400-Q

Photos: Benn Mitchell

| Make and Model | Frequency Response Deviation in db | | Recommended Tracking Force Range | Optimum Tracking Force | Trackability in cm/sec. | | | Price |
|------------------------|------------------------------------|----------------------------|----------------------------------|------------------------|-------------------------|--------|------|-------|
| | Audio Range 20 Hz-20 kHz | Carrier Range 10-50 kHz | | | Low | Middle | High | |
| ADC Super XLM | ±4 | +0, -23 | 0.5-1.25 | 1.0 | 19 | 31.5 | 24 | \$75 |
| Audio-Technica AT12S | ±3 | +0, -6 | 1.25-2.0 | 1.75 | 19 | 25 | 19 | 65 |
| Audio-Technica AT15S | ±2.5 | +5, -4 | 1.5-2.0 | 1.6 | 19 | 20 | 19 | 100 |
| Audio-Technica AT20SL | ±3 | +0, -9 | 1.5-2.00 | 1.6 | 24 | 25 | 19 | 175 |
| Bang & Olufsen 6000 | ±3 | +0, -20 | 0.7-1.5 | 1.2 | 19 | 25 | 24 | 85 |
| Empire 4000D/III | ±3 | +1, -6 | 0.25-1.25 | 1.2 | 24 | 31.5 | 24 | 150 |
| Empire 4000D/I | ±3 | +1, -7 | 0.75-2.0 | 1.4 | 19 | 31.5 | 19 | 85 |
| Panasonic 450C-II | (see text) | (see text) | 1.5-2.5 | 2.3 | 24 | 31.5 | 19 | 65 |
| Pickering UV-15/2400-Q | ±3 | +2, -8 | 1.5-2.5 | 2.0 | 19 | 25 | 19 | 125 |

rier's ultrafine groove wiggles) and a broader contact area that permits the use of higher tracking forces without increased record wear. (The reason wear doesn't increase is that a greater force, when spread over a broader area, results in the same pressure; and it's pressure, not force, that does the damage.) Of course, the tiny, pyramidal facets of the stylus tip have to be ground very precisely, and the diamond tip oriented with extreme accuracy to the stylus shank, difficult processes which largely account for these cartridges' high cost.

Our tests were similar to those we ran in our earlier report on medium-priced stereo cartridges (page 132, Aug. '74), but with three differences: First the cartridges were mounted in two new Philips 209 automatic turntables (page 91, Oct. '74) with low-capacitance cables that would not diminish the cartridges' carrier-frequency response. To obtain more precise frequency-response measurements, we used a Justi-Meter graphic

recorder, then translated the curves it printed into the numerical values shown on our test chart. And we used different frequency-response test records (a Bruel & Kjaer for the 20-20,000-Hz. audio range and JVC for the 10,000-50,000-Hz upper-frequency range) instead of the single test records we used previously.

Since all the cartridges exhibited some response out to 50,000 Hz, and since all, naturally, went out to 20 kHz, we expressed frequency response in decibels as deviations from linear ("flat") response over each of the two ranges we measured.

As might be expected, the deviations were greater in the carrier range, where any response at all is harder to achieve. Again unsurprisingly, the dips in the carrier-frequency curves were far more prominent than the frequency peaks.

But flat frequency response at carrier frequencies, while desirable, is less important than in the audio range. Low carrier output does not

mean a loss of audible frequency response, but an increase in background noise when listening quadraphonically to a CD-4 disc; switch the demodulator to stereo, and the noise diminishes, while the frequency balance remains unchanged. However, once you're engrossed in the dramatic impact of the four-channel effect, the slight increase in background noise rarely interferes with your enjoyment of the music, being noticeable only in very quiet passages.

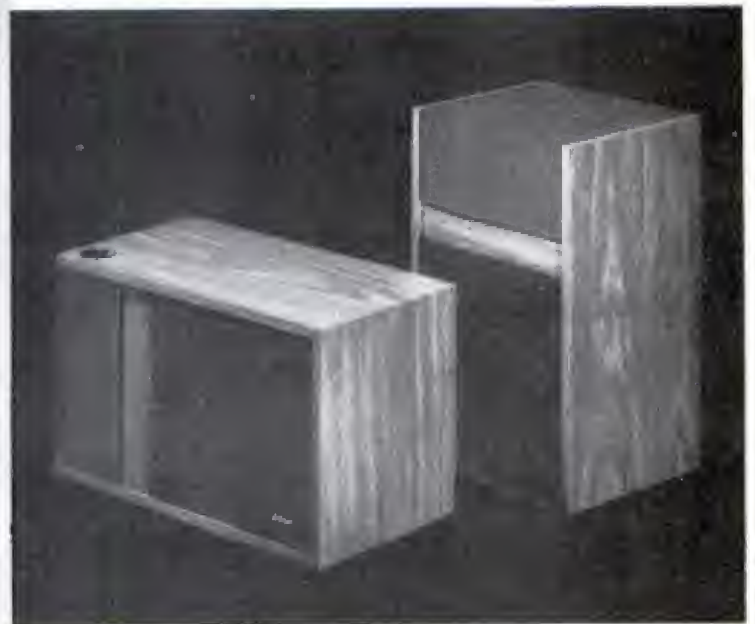
In addition to the frequency-response tests, we also conducted tests for optimum tracking force and "trackability." Both these figures will vary with the tone arm in which the cartridge is mounted—one reason manufacturers list a range of recommended tracking forces. (Sharp-eyed readers may notice that we got different trackability figures for the Audio-Technica AT12S this time than we did in our Aug. 1974, tests us-

(Please turn to page 162)

Electronics: a look at the latest



More versatility for calculators: Printing calculators are slow; display models leave no record, but Casio's new C-100P (far left) has a fast display, plus printer you can switch on when you need it. For hand calculators with display alone, often hard to read on desks, the \$3 Calconverter stand helps; it folds to fit in your pocket, too.



New speakers: Tweeter of Bose 301 (above and far right) angles to direct some sound at you, bounce the rest off nearby walls or ceilings. No wall near? Then turn the knob so the built-in vane (above) reflects the sounds where you want them. For the lowest notes (at the highest prices), Hegeman sub-woofer (right) plays deep tones from 100 Hz to below 16 Hz, some of which you may not have known were there. Sound is very clean; price is \$960 plus cost of an amp to drive it.



"Idiot light" makes this turntable smarter. Like many new turntables, Toshiba's direct-drive 510 has variable-speed pitch control, plus a strobe dial to show fast or slow running. What are new are three lights in front that tell you quickly whether it's running fast, slow or on speed.



'75 IMPORTED CARS

by Bill Hartford,
AUTO EDITOR
and Michael Lamm,
WEST COAST EDITOR



Volkswagen Rabbit is the best value for '75. Two and four-door hatchback models combine performance, economy and prac-

ticality in stylish package. Scirocco (silver, red models, left) is a sporty and more expensive version of the Rabbit.

Most imported cars have a beauty *under the skin*—in their engineering, economy and quality—that makes them exciting to live with. And a bonus is that some of them even have pretty faces!

The most important new import for 1975 is the Volkswagen Rabbit. So we'll start with VW and then discuss the other imported cars in alphabetical order.

Volkswagen. The 1800-pound Rabbit is a mechanical masterpiece from Wolfsburg. Its ohc Four gets it up to 60 mph in about 12 seconds—giving it the edge on some V8 subcompacts. Fuel economy, rated by the EPA at 38 mpg on the highway, was 43 mpg in our mileage test, and that was with driver and two adult passengers. Its hatchback design provides 24.7 cubic

feet of luggage capacity with the rear seat folded.

VW did have a little design help. It consulted with Giorgetto Giugiaro's Ital Design Studio of Turin. What it got was the greatest possible amount of usable interior space into the smallest possible outer shell—and an exterior with some style. To keep down wind noise and to help with fuel-saving streamlining, extensive wind-tunnel tests were run. Jigsaw

Dodge Colt Carousel hardtop is one of five models, now with five-speed manual.



puzzle fans will appreciate how the rear seat, gas tank, spare tire, muffler and rear suspension are all fitted together. Likewise the powerplant, front-wheel drive (fwd), drive train and front suspension.

The Rabbit contains some major components adapted directly from the Audi Fox/VW Dasher, introduced in 1974. The Dasher's engine, front suspension and fwd arrangement, electrical system and heating-vent system are taken into the Rabbit without change. The trans-axle is the same, too, but the differential uses spur gears rather than bevels.

The engine (and this applies, of course, to the Dasher, too) is a 1471-cc, in-line Four set crosswise up front for fwd. Servicing is easy because the entire ignition system

MG Midget is an even better buy for '75. The 1½-liter engine is used and the four-speed gearbox is all synchromesh for the first time. We like the 5-mph bumper treatment up front: could you have thought of a better way?



faces forward. The Zenith two-stage carb is behind the head, but it's still easy to get at. The engine is relatively simple to remove, and it comes out *with* the transaxle—in fact, you can't take out one without the other. There's plenty of room around the engine for good serviceability, even with airconditioning.

The Rabbit uses buckets up front and a bench in back, with deep foot wells and a fairly flat floor, so there's ample room for four and even for five. Behind the rear seat is a large and cleverly conceived luggage locker, accessible through the rear liftgate. There's an upper parcel shelf—a wooden board—that's hinged at the front and comes up automatically with the liftgate when two lift straps are attached. Detaching the lift straps means the parcel shelf remains in place. Or this shelf can be removed entirely, giving a very deep well for luggage or cargo. In addition, the rear seat folds flat for bulky items. So there's really as much room here as in the deck of a full-sized American station wagon.

The Rabbit's main body section consists of a rugged, welded-up structure, but the front fenders, hood and grille may be replaced by unbolting. Front and rear body areas contain crash-crush sheet-metal elements that help absorb impact.

Like the Dasher, the Rabbit uses McPherson-strut front suspension and unequal axle shafts with twin constant-velocity joints on each. Front disc brakes are standard. Steering is by rack and pinion, with a double-jointed safety steering column.

Rear suspension is unique to the Rabbit. It's very light and simple. Two trailing arms go back from a central, transverse, T-section torsion bar that runs across underneath the gas tank. Wheels are located by the trailing arms but also use high-riding coils that enclose the rear shocks.

If both wheels hit a bump at the same time, the transverse torsion bar isn't activated; all springing is taken by the coils. But if only one wheel hits a bump, it activates the torsion bar. In hard cornering, the torsion bar also acts as a stabilizer, helping to keep rear tires firmly on the ground.

The Rabbit comes in two and four-door versions; its sporty sister, the Scirocco, as a two-door. The Scirocco is to the Rabbit what the discontinued Karmann-Ghia was to the Beetle: a sports model sharing the same engine, drive train and mechanicals.

The Dasher remains virtually unchanged from 1974, but a hatchback coupe has been added (no picture available yet). There are minor improvements in door locks and disc brakes. The VW security blanket warranty continues, as does plug-in electronic diagnosis for all VWs.

For the Beetle and La Grande Bug, changes are minor and aimed mostly at smog certification: electronic fuel injection, with horsepower and torque up slightly. The 1975 Beetle also has a better heater and a lighter clutch. Outwardly, it's identifiable by a single exhaust pipe and a slight bustle bulge under the back bumper to cover the catalytic converter.

Alfa Romeo. The Alfa line is essentially unchanged for '75 since later in the year the new Alfetta GT and sedan will be introduced here (see *Imports and Motorsports*, page 36, Nov. '74).

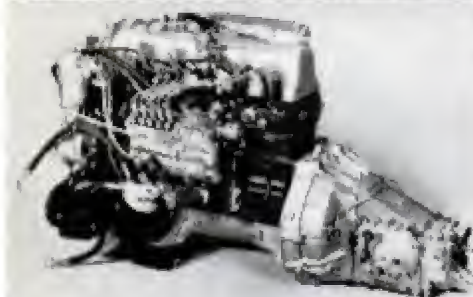
Audi. Both the Fox and the 100LS go to fuel injection this year, and the Fox gets a slightly larger (1588-cc vs. 1471-cc in 1974) engine. Horsepower is up in both cars, as is fuel mileage, and Audis need catalytic converters only in California.

Austin. The Marina continues fairly unchanged for '75—except for a little bonus: Price has been rolled back \$400, making it less than \$2500—which is hard to beat!



Fiat 131 wagons (top) replace those in discontinued 124 series. For more on the new models see *Imports and Motorsports*, page 14, Feb. '75.

Lancia Beta sedans and coupes (above) are all new entries in the American market. Long a prestigious marque in Europe, the cars will be marketed here by the Fiat dealer network, whose mechanics will be familiar with the 1.8-liter dohc Fiat Four used in both models. The front-wheel-drive and all-around independent suspension features are suited to hard, acrobatic driving as we found out in Italy. The sedan is especially roomy and comfortable, but doesn't approach the coupe's exciting styling, which extends to the interior layout, too, as shown above. If you can get away with the coupe's 2+2 seating, it's the clear choice of the two.



Mercedes-Benz 300D is the hottest diesel on the road. The three-liter, five-cylinder powerplant moves this sedan as you would expect a luxury car to move. The "world's most expensive economy car" (\$12,000, 31 mpg), also has simplified starting and shutdown—everything operated by the key.

BMW gets a brand-new, medium-sized line, the 530i. This luxurious, sporty four-door fits between the four-cylinder 2002 series and the six-cylinder 3.0 Si.

The 530i borrows the 3.0 Si's ohc, in-line Six—a three-liter engine whose sophistication includes hemispherical combustion chambers with a crossflow head and electronic fuel injection. The drive train is conventional: engine up front, drive wheels out back, but the car uses a deDion live axle with high-mounted coils all around. The spring perches incorporate foam-cell polyurethane pads that compress some 80 percent to help cushion hard jolts.

The 530i's unit body has crush sections front and rear, integrated rollbars, and catch hooks to keep the hood from flying open in a crash. Thin greenhouse pillars keep visibility at a maximum.

Luxurious interior appointments include a quartz-crystal clock, infinitely adjustable reclining seats, and

| Car— Series: Models | Body Style | Wheel- base (in.) | Overall Length (in.) | Overall Width (in.) | Engine* (cubic centimeters, in-line Four except as noted) | 1975 Changes (not federally regulated) |
|---|--|-------------------------|----------------------------|---------------------------|---|---|
| ALFA ROMEO 2000 Berlina 2000 GT Veloce 2000 Spider Veloce | 4-dr. 2-dr. coupe 2-dr. roadster | 101.1 92.5 88.6 | 167.9 167.9 167.9 | 61.6 64.2 64.2 | 2000 2000 2000 | Refinements Refinements Refinements |
| AUDI Fox | 2-dr., 4-dr. sedan | 97.2 | 172.0 | 64.7 | 1588 fwd | Refinements, fuel injection |
| 100LS | 2-dr., 4-dr. sedan | 105.3 | 187.2 | 69.0 | 1871 fwd | Refinements, fuel injection |
| AUSTIN Marina | 2-dr., 2-dr. GT, 4-dr. | 96.0 | 169.0 | 64.8 | 1798 | Unchanged |
| BMW 2002, 2002ii 530i 3.0 Si | 2-dr. sedan 4-dr. sedan 4-dr. sedan | 98.4 103.8 106.0 | 176.0 189.9 195.0 | 62.6 67.2 68.9 | 1990 2985-6 2985-6 | Refinements All-new car Refinements |
| CAPRI II 2300, 2800 | 2-dr. hatchback | 100.8 | 174.8 | 66.9 | 2300, 2800-V6 | Restyled, larger base engine |
| DATSUN B-210 | 2-dr., 4-dr. sedan, hatchback | 92.1 | 163.0 | 60.8 | 1397 | Larger engine |
| PL-710 | 2-dr., 4-dr. sedan, 2-dr. hdt., wagon | 96.5 | 171.7 | 62.2 | 1952 | Larger engine, radial tires, bigger brakes |
| PL-610 | 2-dr. sedan, 4-dr. sedan, wagon | 98.4 | 175.0 | 63.0 | 1952 | |
| 260Z 280Z | 2-dr. hatchback 2+2 | 90.7 102.6 | 173.2 185.4 | 64.2 65.0 | 2754-6 2754-6 | Larger engine, fuel injection |
| DODGE Colt | 2-dr. coupe, 2-dr. hdt., GT, 4-dr. | 95.3 | 171.1 | 63.6 | 1600, 2000 | Five-speed transmission |
| FERRARI Dino 308 GT4 | 2+2 coupe | 100.4 | 169.3 | 71.0 | 2926-V8 | All-new car |
| FIAT 128 | 2-dr. sport coupe 2-dr. & 4-dr. sedan, wagon | 87.5 96.4 | 156.4 158.6 | 61.4 62.6 | 1290 fwd | Refinements |
| 124 | Sport coupe Sport convertible | 95.3 89.8 | 172.4 163.1 | 65.8 63.5 | 1756 | Refinements |
| 131 | 2-dr. & 4-dr. sedan, wagon | 98.0 | 169.4 | 64.2 | 1756 | New model replaces sedans and wagon |
| X 1/9 | Mid-engine roadster | 86.7 | 153.5 | 61.8 | 1290 | Unchanged |
| HONDA Civic | 2-dr. sedan, hatchback | 86.6 | 146.9 | 59.3 | 1237 fwd | Refinements |
| Civic CVCC | 2-dr. sedan, hatchback | 86.6 | 150.0 | 59.3 | 1488 fwd | New stratified- change-engine model |
| JAGUAR XJ6L, XJ12L E-Type V12 | 4-dr. sedan 2+2 coupe, roadster | 112.8 105.0 | 198.8 189.6 | 69.7 66.1 | 4235-6, 5343-V12 5343-V12 | Refinements Refinements |
| JENSEN Jensen-Healey Interceptor Mark III | 2-dr. roadster 2-dr. coupe & convertible | 92.0 105.0 | 161.9 186.0 | 63.2 69.0 | 1973 7200-V8 (Chrysler 440) | Refinements Refinements |
| LAMBORGHINI Jarama Espada Urraco | 2+2 coupe 2-dr. coupe Mid-engine coupe | 93.7 104.3 96.5 | 176.6 186.5 167.3 | 71.7 73.2 69.3 | 3929-V12 3929-V12 2463-V8 | All-new car All-new car All-new car |
| LANCIA Beta | 2-dr. coupe 4-dr. sedan | 92.5 100.0 | 157.1 168.8 | 65.0 66.5 | 1756 fwd 1756 fwd | All-new car All-new car |
| LOTUS Elite | 2-dr. hatchback | 97.8 | 179.5 | 71.0 | 1973 | Unchanged since 1974½ introduction |
| Europa | Mid-engine sports car | 92.0 | 157.3 | 64.5 | 1600 | Unchanged |
| MASERATI Bora Merak Khamzin GT | Mid-engine coupe Mid-engine coupe 2+2 coupe | 102.3 102.3 100.3 | 177.0 177.8 173.0 | 69.6 69.6 71.0 | 4930-V8 2965-V6 4930-V8 | Unchanged All-new car All-new car |

*Not all engines available in all models

fwd, front-wheel drive

4wd, four-wheel drive

power steering. The 530i and 3.0 Si use four-wheel disc brakes, and all BMWs are available with optional automatic transmissions.

Capri. The new Capri II hatchback (see *Imports and Motorsports*, page 14, Jan. '75) has a bigger base engine (2300 cc vs. 2000 cc last year). This ohc Four continues with the four-speed manual transmission as standard equipment.

The V6 version (2800 cc) is available optionally and includes heavy-duty driveline components. There are three Capri II trim levels for 1975: standard, Decor Group and Ghia.

Datsun. The B-210 pushrod engine goes to 1400 cc this year as against 1300 cc last, and the PL-710 now uses the 610 engine, up 200 cc. Everything else stays pretty pat. The 260Z and new 280Z come in two and

OF ALL IMPORTED 1975 CARS

| Car— Series: Models | Body Style | Wheel- base (in.) | Overall Length (in.) | Overall Width (in.) | Engine* (cubic centi- meters, in-line Four except as noted) | 1975 Changes (not federally regulated) |
|--|--|-------------------------------|----------------------------------|------------------------------|---|--|
| MAZDA 808 | 2-dr. coupe, 4-dr. sedan, wagon | 91.0 | 168.0 | 63.0 | 1586 | Unchanged |
| RX-3 | 2-dr. coupe, 4-dr. sedan, wagon | 91.0 | 168.0 | 63.0 | 1146-2-rotor | Refinements |
| RX-4 | 2-dr. hdt. coupe, 4-dr. sedan, wagon | 99.0 | 179.0 | 66.0 | 1308-2-rotor | Refinements |
| MERCEDES-BENZ 230, 240D 300D | 4-dr. sedan 4-dr. sedan | 108.3 108.3 | 195.5 195.5 | 69.7 69.7 | 2300-gasoline, diesel 3000-5-diesel | Refinements New 5-cyl. model |
| 280, 280C 280S, 450SE, SEL | 4-dr. sedan, coupe 4-dr. sedan | 108.3 112.6 | 195.5 205.5 | 67.7 73.6 | 2746-6 2746-6, 4500-V8 | Refinements 280S new model, refinements |
| 450SL, SLC | 2-dr. coupe/roadster 2+2 coupe | 96.9 111.0 | 182.3 196.4 | 70.5 70.5 | 4500-V8 4500-V8 | Refinements Refinements |
| MG Midget | 2-dr. roadster | 80.0 | 141.0 | 54.9 | 1491 | Larger engine, syn- chromesh trans. Refinements |
| MGB, MGB/GT | 2-dr. rdstr., hatchbk. | 91.0 | 159.5 | 59.9 | 1798 | Refinements |
| OPEL Manta, 1900 | 2-dr. coupe, sedan, wagon | 95.7 | 176.1 | 64.3 | 1900 | Refinements, fuel injection |
| PEUGEOT 504 | 4-dr. sedan wagon | 108.0 114.0 | 182.4 194.4 | 66.7 66.7 | 1971-gasoline, 2112-diesel | Refinements |
| PORSCHE 914 911S, Carrera | Mid-engine roadster 2+2 coupe, Targa | 96.5 89.4 | 164.4 168.9 | 65.0 63.4 | 1795, 1971-flat 4 2687-flat 6 | Refinements Refinements |
| RENAULT 12, 12L, 12TL | 4-dr. sedan, wagon | 96.0 | 174.0 | 64.5 | 1647-fwd | Higher horsepower, refinements |
| 15TL | 2-dr. coupe | 96.0 | 172.0 | 64.0 | 1647-fwd | Higher horsepower, refinements |
| 17FL, Gordini | 2-dr. coupe, coupe convertible | 96.0 | 172.0 | 64.0 | 1647-fwd | Higher horsepower, refinements |
| ROLLS-ROYCE Silver Shadow, Corniche | 4-dr. sedan, 2-dr. sedan, convertible | 119.5 | 207.5 | 71.0 | 6750-V8 | Refinements |
| SAAB 99LE, EMS, WagonBack | 2-dr., 4-dr. sedan, hatchback | 97.8 | 174.0 | 66.5 | 1985-fwd | Refinements |
| SUBARU Star series | 2-dr., 4-dr. sedan, wagon, coupe | 96.6 | 164.4 | 59.2 | 1360-flat 4-fwd | Refinements, 4wd wagon, auto. trans. |
| TOYOTA Corolla 1600, SR-5 Corona RT, SR-5 Celica ST, GT Mark II | 2 & 4-dr. sedans, wagon, hardtop 2 & 4-dr. sedans, 2-dr. hdt., wagon 2-dr. hdt. coupe 2-dr. hdt., 4-dr. sedan, wagon | 93.3 98.4 95.5 101.7 | 165.2 173.2 171.5 182.1 | 61.8 63.4 63.4 64.4 | 1588 2189 2189 2563-6 | Restyled, more models Bigger ohc hemi- engine Refinements, 5- speed GT Refinements |
| TRIUMPH Spitfire 1500 TR6 TR7 | 2-dr. roadster 2-dr. roadster 2-dr. coupe | 83.0 88.0 85.0 | 156.3 162.0 164.5 | 58.5 58.0 60.2 | 1493 2498-6 1988 | Refinements Unchanged All-new car |
| TVR 2500M | 2-dr. coupe | 90.0 | 164.0 | 64.0 | 2498 | Unchanged |
| VOLKSWAGEN Beetle La Grande Bug Rabbit Scirocco | 2-dr. sedan 2-dr. sedan, convert. 2-dr., 4-dr. hatchbk. 2-dr. hatchback sport coupe | 94.5 94.5 94.5 94.5 | 163.4 155.3 155.7 | 61.0 63.4 64.0 | 1584-flat 4 1471-fwd 1471-fwd | Fuel-injection All-new car All-new car |
| The Thing Dasher | 4-dr. utility vehicle 2-dr., 4-dr. sedan, wagon, 2-dr. hatchbk. | 94.5 97.2 | 148.8 172.8 | 64.6 63.0 | 1584-flat 4 1471-fwd | Unchanged New hatchback model |
| VOLVO 240 series 164 | 2-dr., 4-dr. sedans, wagon 4-dr. sedan | 104.0 107.0 | 192.0 192.0 | 67.1 67.1 | 1986 2978-6 | New suspension, steering, refine- ments Refinements |



Toyota Corolla is restyled, has five-speed transmission and transistorized ignition.



Volvo 240 Series (242 two-door, 244 four-door and 245 five-door wagon) gets major front-end improvement in suspension, steering and appearance, with all redesign based on findings in Volvo's experimental safety vehicle (ESV) program.

rear-window defogger, reclining front buckets, mag-like wheels, rack-and-pinion steering, radial tires, extensive rustproofing, and crash-crush front and rear body sections.

The Fiat 124 coupe and convertible, the 128 series and the sporty X1/9 roadster are virtually unchanged.

Honda introduces its clean-air engine, the stratified-charge CVCC, plus a sport package that includes a five-speed gearbox, fancy wheels, and two-tone upholstery.

The CVCC engine is a four-cylinder unit, and to understand it, you have to realize that there are basically two ways to clean up the exhaust of an internal-combustion engine: 1) hang on catalytic converters or other afterburners or, 2) run the engine with an extremely lean (oxygen-rich) fuel mixture. Honda's stratified-charge engine does the latter and thereby doesn't need any other smog equipment.

The CVCC engine has a small pre-combustion chamber, with its own valve and intake port, off to one side of each combustion chamber. The normal intake system draws a very lean mixture into the cylinder. Then, at the same time, the tiny precombustion chamber gets a small, relatively rich charge of fuel through its own separate valve and intake port. The sparkplug rests in the pre-

(Please turn to page 172)

four-seater versions, use a slightly bigger Six with fuel injection and six more horses.

Dodge Colt. The top-line GT sports hardtop is now called the Carousel. It has fancy exterior trim, a denim vinyl interior, and a five-speed overdrive transmission. The five-speed will become optional in Colt sedans and wagons later this year.

Ferrari. Ferrari will concentrate

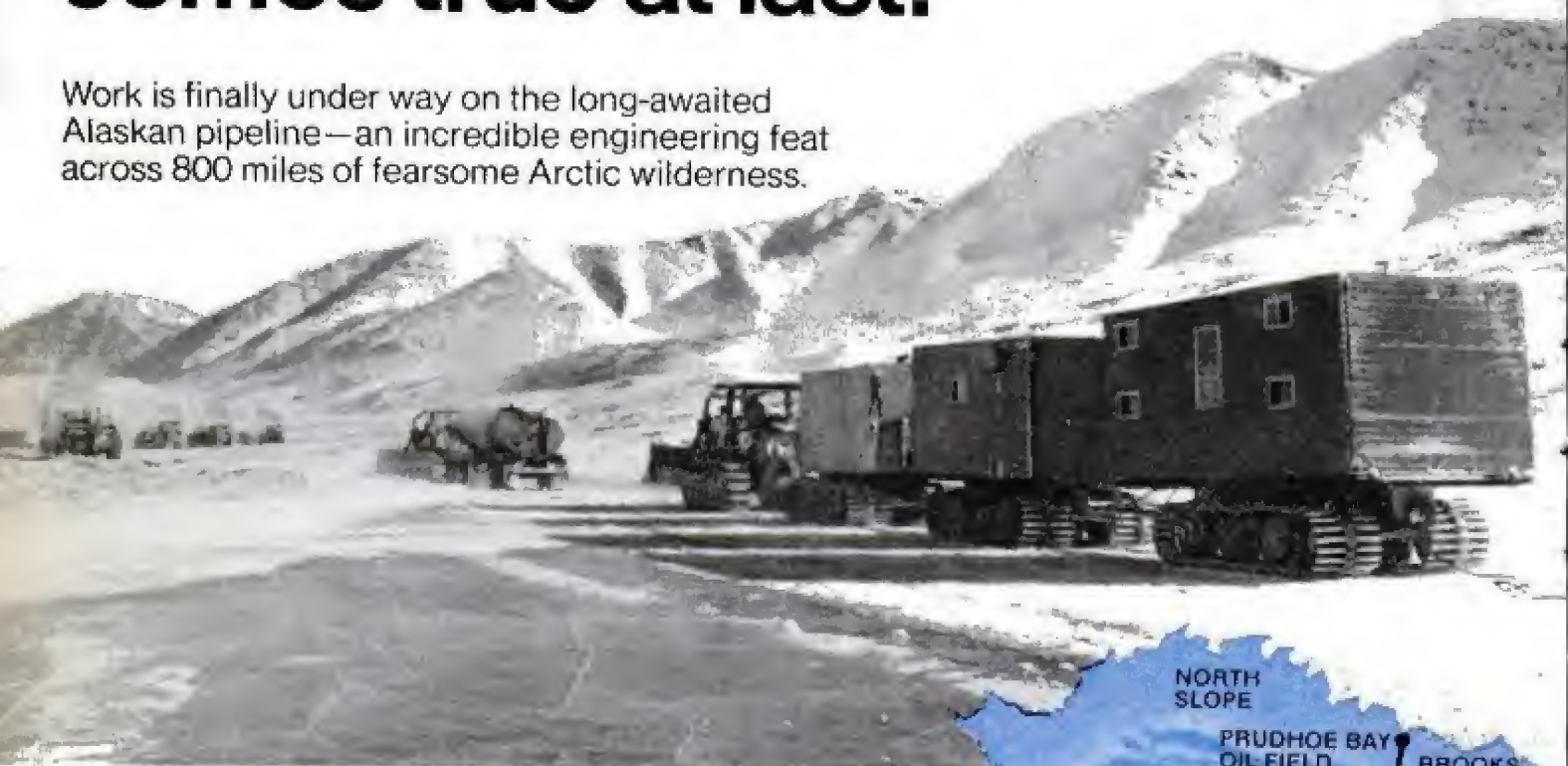
on importing only one series in 1975—the Dino 308 GT4. This mid-engined fastback replaces last year's Dino 246 GTS, the Daytona, and the 365 GTC/4.

Fiat. Big news from Fiat this year is the 131 series, which replaces the 124 sedans and wagon.

Among the 131's standard items are five-speed overdrive transmission, tilt steering wheel, tach, tinted glass,

Big pipe dream comes true at last!

Work is finally under way on the long-awaited Alaskan pipeline—an incredible engineering feat across 800 miles of fearsome Arctic wilderness.



by Norman Sklarewitz

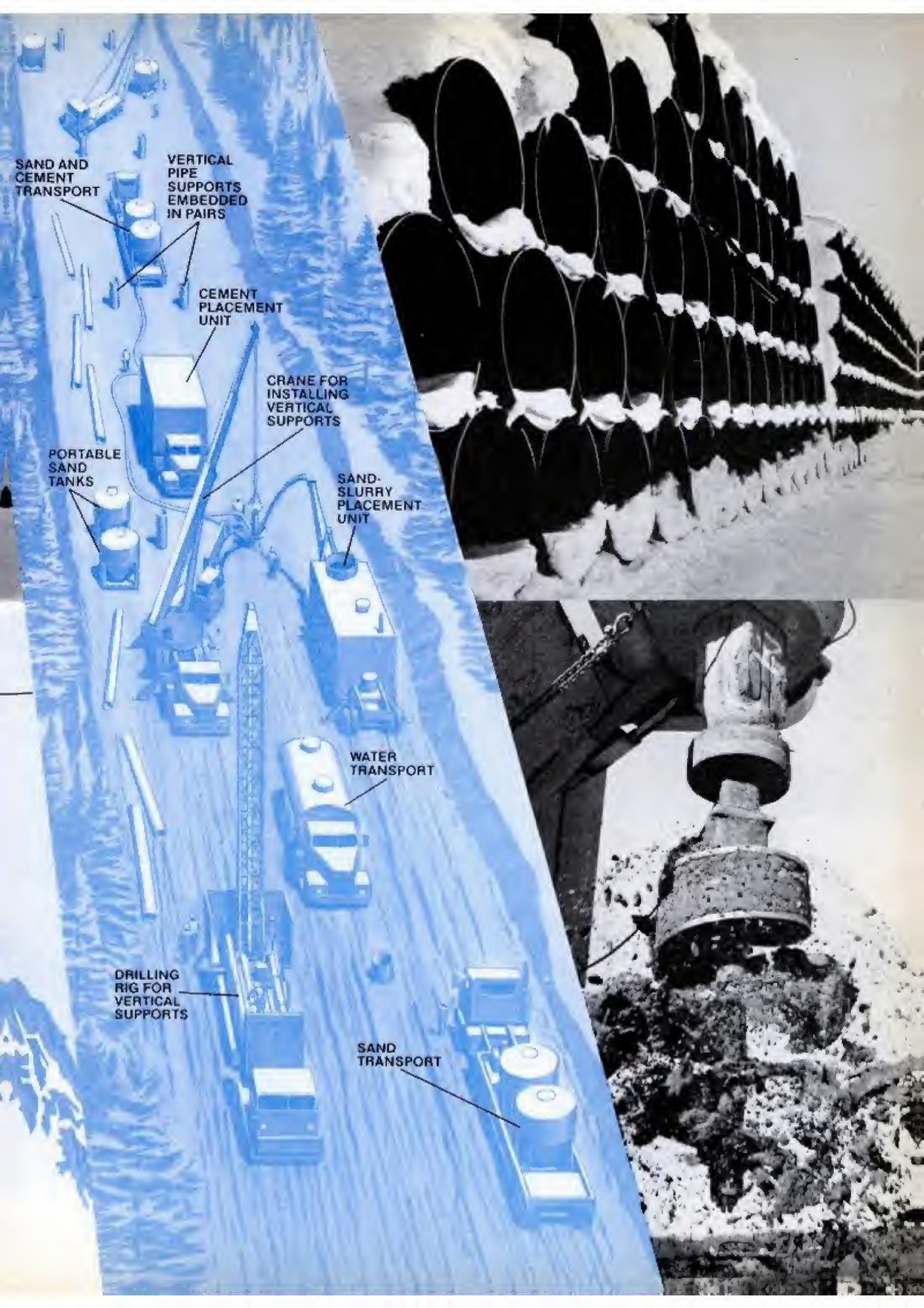
Art: Adolph Brotman

On the rim of the Arctic's Beaufort Sea the crackling-cold silence of a once-deserted wilderness is now being shattered by thundering new sounds. Giant drilling machines grind two-foot-diameter auger bits 36 feet down into the frozen ground, spewing ice, earth and rock skyward in a spectacular shower. An army of strangely garbed men and science-fiction-like monster machines lumbers slowly and ponderously along behind the drilling rigs—the beginning of a trek that will cover nearly 800 miles of rugged Arctic wasteland and represent one of the most fantastic engineering adventures in history.

The much-talked-about, long-awaited, bitterly fought-over Alaskan pipeline is finally beginning to become a reality. The holes now being drilled are for mammoth support columns that will elevate the pipeline above the Arctic tundra for much of its 798-mile run from Alaska's North Slope southward to the sea. While crews are drilling these first holes in the north, another army of men and machines some 300 miles to the south is busy sinking piers into the ice-laden Yukon River for a half-mile-long bridge that will



Map shows 800-mile route of pipeline across Alaska from Prudhoe Bay in north to Valdez port in south. Artist's concept at right depicts complex army of machines for installing elevated pipe supports. At far right top, stacks of snow-draped pipe sections stretch almost as far as eye can see. At lower right, 24-inch auger bit drills holes at foot a minute.



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VERTICAL
PIPE
SUPPORTS
EMBEDDED
IN PAIRS

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UNIT

CRANE FOR
INSTALLING
VERTICAL
SUPPORTS

PORTABLE
SAND
TANKS

SAND-
SLURRY
PLACEMENT
UNIT

WATER
TRANSPORT

DRILLING
RIG FOR
VERTICAL
SUPPORTS

SAND
TRANSPORT



Giant mobile crane lowers 60-foot length of 18-inch pipe into ground in first stage of erecting elevated pipeline supports.



Insulating shell is clamped around outside of pipe in one operation with this special clawlike device on end of derrick boom.



Aerial view shows service road bulldozed through trackless regions of the Arctic to carry machinery to construction sites.

carry the pipeline over the water.

Another 300 miles farther south, at the end of a picture-postcard fjord emptying into Prince William Sound, still another army is converting the once-tiny, tranquil town of Valdez on the coast into the North Country's biggest and most elaborate port terminal. Its original population of 1000 has already tripled and is about to double again. When work is completed on the port, Valdez will be capable of transferring two million barrels of oil a day from the pipeline to the bellies of 35 104,000-ton tankers that will ferry the precious petroleum to refineries in Washington State and California.

What's happening in Alaska today began in 1968 when Atlantic Richfield and Exxon drilled their 11th and "last-shot" exploratory oil well at Prudhoe Bay—and came in with a 2300-barrel-a-day bonanza (the average U.S. well produces 14 barrels a day). Later strikes indicate a field with recoverable reserves of nine billion barrels of oil. Some geologists think there may be additional 20 to 40-million-barrel reserves. If this proves out, the North Slope will be the world's largest oil field.

The pipeline to tap it is not only acknowledged to be the biggest, most formidable civilian construction job ever undertaken, but it will also be the most expensive. The original estimated cost was put at \$900 million. Now rampaging inflation, ecological pressures and incredible engineering problems imposed by the hostile Arctic environment have run the expected tab up to nearly \$6 billion before anticipated completion in 1977. During that time, some 30,000 people will have been hired to maintain a work force of 14,000 to 16,000 in peak construction periods. More than 35 million man-hours of work on the pipeline are scheduled for this year alone.

While employment possibilities might seem plentiful, adventurous job-seekers are warned to stay away unless they have a firm commitment of work. For one reason, much of the work force is being recruited from local Alaskans, and the big pipe rush is already on. There are simply no accommodations left for anyone "floating loose."

Since no single corporation could swing such an enterprise alone, a consortium of eight oil companies formed the Alyeska Pipeline Service Co. to design, build and operate the 800-mile system. From headquarters at North Post, a former Army base near Fairbanks, Alyeska oversees operations of its two major contractors—Bechtel, Inc. for road and pipeline, and Fluor Alaska, Inc., for pumping stations and port terminal. Under these Goliaths are dozens of smaller subcontractors and even more sub-subcontractors numbering into the hundreds.

Anyone interested in exploring employment possibilities on the pipeline is advised to write the Alyeska Pipeline Service Co., 1835 South Bragaw, Anchorage, Alaska 99504. Request a booklet, *The Truth About Pipeline Jobs in Alaska*, and a list of current contracting firms.

To give some idea of the staggering size and problems involved, the pipeline and its service road will have to cross three mountain ranges—one through a 4800-foot-high pass in the Brooks Range—70 major rivers and three active earthquake-prone seismic faults. Winter temperatures range down to 68° F. below zero, and the nights are nearly 24 hours long for months at a time. Such extreme cold can shatter brittle metal at a tap and quickly sap the strength of men. Touch a piece of metal with a bare hand and the two will freeze together instantly. For this reason, metal doorknobs on con-



Huge port terminal at Valdez, when finished, will transfer two million barrels of oil a day to tankers for shipment south.



Dwarfed by mighty Gulkana Glacier at Isabel Pass in Alaska Range is one of many construction camps along pipeline route.

struction-camp buildings are taped over. One uninitiated carpenter made the mistake of popping a handful of nails into his mouth at 50 below. He spent some time in sickbay waiting for the spikes to warm enough to be removed without tearing out the inside of his mouth.

So vast is the job that just the preparation work alone took more than a year before the first hole could be drilled. First came a string of 19 construction camps—each a self-contained base with life-support systems nearly as elaborate as those for a moon colony. Huge C-130 cargo planes, landing on makeshift runways of snow and ice, brought in food, machinery, building materials and other supplies. What couldn't be flown in had to be hauled overland in tracked vehicles, often operating precariously in unknown terrain or heavy, blinding snow. Forty inches of ice will support a normal highway load—if you keep your trucks spread out. On at least one occasion, two D-9 skidders learned this the hard way. They pulled alongside each other for a chat on four-foot ice, and both broke through into the water. Luckily, the drivers jumped clear in time, and later the Cats were recovered.

With base camps completed, an access road for pipe-laying equipment had to be bulldozed through country where no roads ever existed before. There were no dependable maps, and no way of keeping the Cats on a pre-determined trail. Ingenuity was the name of the game. One Cat driver got lost in the mountains and radioed for help. The enterprising bush pilot who went out to look for him took along a 50-mile roll of string. When the pilot spotted the Cat, he started reeling out the string as he headed back to base. All the driver had to do was follow the string home. The resulting road north of the Yukon

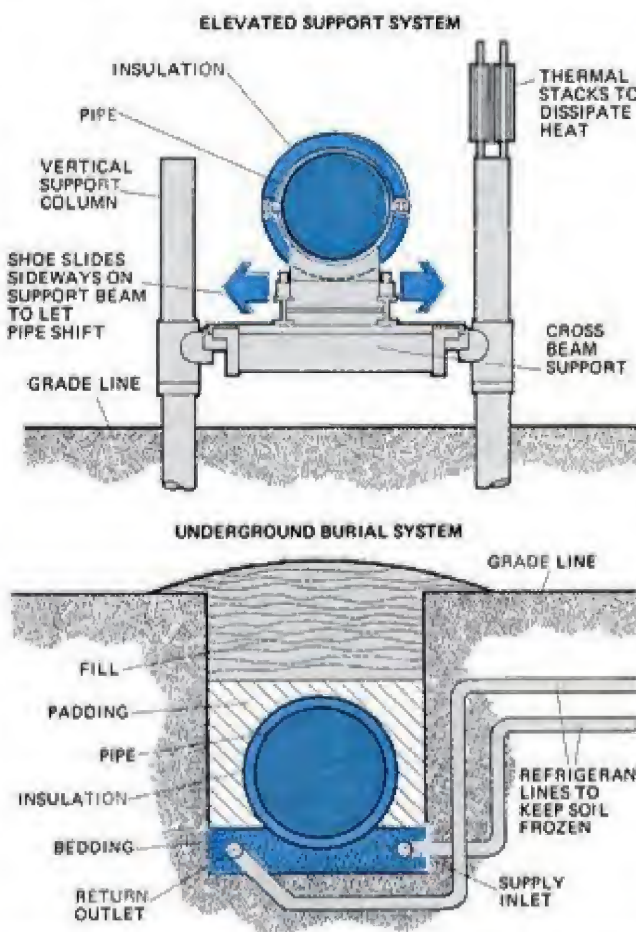
is the first ever to cross the Arctic Circle in Alaska.

Survival on the pipeline is something no one takes lightly. Newly arriving workers in recreational winter gear, such as snowmobile and ski suits, find they're practically undressed. Vapor-barrier boots, thermal underwear, insulated coveralls, hoods, face masks, waterproof waders and down parkas are basic necessities for staying alive. Even the protective hardhat helmets must be wool-lined for warmth. Camp bulletin boards carry notices warning about the dangers of hypothermia—"a rapid, progressive mental and physical collapse" that results from

exposure to cold, wind and exhaustion.

Helicopter pilots carry survival kits at all times, no matter how short the trip. The possibility of being caught in a sudden Arctic "white-out" is an ever present danger. This is a polar phenomenon that occurs when an overcast sky reflects the white of the snow, and ground and sky blend into a single, featureless blur. There is no visible horizon line—nothing to guide a pilot—and the only solution is to get down fast. One downed crew, stranded for two weeks in subzero weather, built an igloo and with food and candles managed to survive. Body heat and a single

(Please turn to page 176)



Two methods of installing pipeline are shown at left. Where permafrost prevents underground burial due to melting problems from oil's heat, pipe will be elevated on pairs of columns spaced 60 feet apart, with freely sliding shoes on cross beams to permit pipe to shift. Where pipe must be buried to preserve environment, cooling coils under it will keep ground from melting. Where soil is unfrozen, pipe can be buried without coils—the simplest, cheapest way. Author Norman Sklarewitz visited construction sites in Alaska for PM to bring readers this first-hand report.



Looking like rock, this exposed permafrost is actually frozen earth underlying much of northern Alaska to 2000 feet deep.



Working under tentlike plastic shelters to protect them from the intense Arctic cold, welders join sections of steel pipe.



Air-inflated structure, named "Beluga" after whale it resembles, is used as temporary construction building at many sites.

Let your mower do the yardwork

Mulchers, grass baggers, lawn rollers, utility carts, snow throwers and other accessories make the 1975 riders versatile performers.

by Glenn Hensley



Typical of trim, compact riders on the market is this 7-hp, three-speed Murray, equipped with 30-inch mowing deck.

There was a time when the riding mower fulfilled its owner's expectations if it did a fair cutting job—not leaving too many bare scalps in its wake—and didn't stall too often. But a lot more is expected of today's machines.

New work-saving attachments add to the usefulness of the '75 riders. Among the many makes on the market you'll find all these included as options: leaf mulchers, snow blades, snow throwers, lawn sweepers, utility carts, lawn rollers, power sprayers, aerators, side-mounted grass hoppers, grass baggers, lawn vacuums, rotary spreader-seeders and dump carts.

If you acquire just a few add-ons, say a leaf mulcher, snow blade and dump cart, you'll find your mower is no longer a "lazy" machine, sitting idly in the garage between lawn mowings.

Of course, moving up to a rider will cost a few bucks. You can expect to pay from a minimum of \$450 to more than \$1000 for the basic mower. Attachments can run the bill up to whatever limit you set. But



A 6-hp engine provides ample power for Massey-Ferguson's new MF 626 mower. It has 26-inch cutter, adjustable up to height of 3 3/4 inches.



Rear-mounted grass catcher on John Deere Model 68 (above) makes it easy to trim around trees, near fences.

Toro offers line of accessory equipment for its three riders. All have mowers that cut a 25-inch swath.



A 500-pound-capacity cart is available as accessory for the John Deere riders. It has high-flotation tires.

The Wheel Horse A-65 (right) is an electric, powered by three 12-volt batteries. Unit has on-board charger.



Simplicity's 8-hp rider can be equipped with a five-bushel-capacity collection hopper for grass clippings or leaves.

| Make/Model | HP | Engine location | Starting | Cutting width (inches) |
|-----------------|--------|-----------------|---------------|------------------------|
| Allis-Chalmers | 405 | Rear | Recoil | 26 |
| | 508 | Rear | Electric | 30 |
| AMF | 1294 | Rear | Recoil | 26 |
| | 1291 | Rear | Electric | 30 |
| | 1292 | Rear | Electric | 30 |
| | 1260 | Front | Recoil | 26 |
| | 1261 | Front | Electric | 32 |
| | 1282 | Front | Electric | 36 |
| | 1281 | Front | Electric | 36 |
| | 1288 | Front | Electric | 42 |
| Ariens | 830DE | Rear | Electric | 30 |
| | 830E | Rear | Electric | 30 |
| | 830R | Rear | Recoil | 30 and 36 |
| | 630R | Rear | Recoil | 30 |
| | 726E | Rear | Electric | 26 |
| | 726R | Rear | Recoil | 26 |
| Balens | 828 | Rear | Recoil | 28 |
| | 829 | Rear | Electric | 28 |
| Homelite | RE-5 | Rear | Recoil | 26 |
| | RE-30 | Rear | Recoil | 30 |
| | RE-8E | Rear | Electric | 30 |
| Huffy | H520 | Front | Recoil | 24 |
| | H260 | Front | Recoil | 26 |
| | H270 | Front | Electric | 26 |
| | H350 | Front | Recoil | 32 |
| | H360 | Front | Electric | 32 |
| John Deere | 66 | Rear | Electric | 30 |
| | 68 | Rear | Electric | 30 or 34 |
| | 90 | Electric | — | 34 |
| Massey-Ferguson | MF626 | Rear | Recoil | 26 |
| | MF632 | Rear | Recoil | 32 |
| Murray | 5-2053 | Rear | Recoil | 26 |
| | 5-2513 | Rear | Recoil | 26 |
| | 5-3013 | Rear | Recoil | 30 |
| | 5-3033 | Rear | Electric | 30 |
| | 5-3043 | Rear | Recoil | 30 |
| | 5-3063 | Rear | Electric | 30 |
| | 5-3233 | Rear | Electric | 32 |
| Simplicity | 3005 | Rear | Recoil manual | 26 |
| | 3008-2 | Rear | Recoil | 30 |
| | 3008-3 | Rear | Electric | 30 |
| | 3008 | Front | Electric | 36 |
| Toro | 56022 | Rear | Recoil | 26 |
| | 56027 | Rear | Electric | 26 |
| | 56033 | Rear | Electric | 26 |
| Wheel Horse | A-80 R | Front | Recoil | 32 |
| | A-80 E | Front | Electric | 32 |
| | A-60 | — | — | 32 |
| | A-65 | — | — | 36 |
| | A-50 | Rear | Electric | 26 |
| White | R-80 | Rear | Recoil | 26 |
| | R-80 | Rear | Electric | 34 |
| | E-800 | Front | Electric | 26 |
| Yard-Man | 1700 | Rear | Recoil | 26 |
| | 1720 | Rear | Recoil | 26 |
| | 1730 | Rear | Electric | 26 |
| | 1760 | Rear | Recoil | 32 |
| | 1770 | Rear | Electric | 32 |

the greatly increased usefulness of a rider with attachments generally makes the investment worthwhile.

Riding mowers are recommended for lawns larger than half an acre—a lawn smaller than that can be handled comfortably with a walk-behind machine.

If you are ready for a rider, here are some buying tips from Paul H. Silliman, a lawn and garden authority with the Homelite Co.:

■ If you insist on a lawn with a manicured look, make sure the mower has pneumatic tires. Semipneumatic and hard-rubber tires can leave ridges and tire impressions in a smooth lawn.

■ Be sure that the height of the mower pan can be adjusted from the operator's seat. Unless your lawn is as flat as a billiard table, different sections will require different cutting heights. It's a nuisance to have to

Accessories speed lawn clean-up chores



High-volume grass catcher, attached to any of three Homelite mowers, holds five bushels—about 75 pounds—of clippings.



Two standard 20-gallon garbage bags hold clippings collected in the Grass Bagger, which fits most mowers in Ariens line.

John Deere Electric 90 can be equipped with snow blade. Other accessories available include lawn sweeper and dump cart.



dismount each time you have to adjust the cutting height.

■ Check size of the mower's gas tank, which can vary from two to five quarts in capacity. Tank size governs a machine's running time. (Remember, it can be dangerous to refuel a hot or running engine.)

■ Be sure that the mower has a cutting width adequate for your lawn. Riding mowers are available with blades that cut widths from 25 to 36 inches. The bigger the blade, the shorter the cutting time.

■ It's useful to have a mower with several forward speeds. You use a slow speed for thick grass and the faster speeds for well-manicured lawns.

In addition to greater versatility, the 1975 mowers are safer to use. Many machines are equipped with improved brakes, better-shielded engines and have gas-filler pipes located so that fuel won't spill on a hot muffler. Some machines have a pressure switch in the seat to kill the engine if the operator dismounts while the cutter is still engaged.

Safety standards for the industry are the concern of the Outdoor Power Equipment Institute in Washington, D.C. The Institute's seal—triangular in shape and bearing the letters OPEI—will be found on all machines approved for safety by the Institute. The seal assures the buyer that a model of the mower he purchases has been thoroughly tested by an independent lab.

In one test, nails are injected into the path of the blade while the engine is turning at full speed and the

mower is encircled by a marked wall to check angle of discharge. A low trajectory of the nails—or other potential projectiles you may run over while mowing—indicates a measure of protection against the danger of flying objects.

In another test, a probe resembling the human foot is inserted into the discharge chute. If the blade makes contact with the probe, the mower fails.

Structural integrity is tested by suddenly injecting a steel rod into the path of the blade of a mower running at full speed. There can be no failure that would be hazardous to operator or bystander.

The safety standard also requires a limited blade stopping time—within seven seconds—and a splash shield



The Bolens 828 has interlocking safety switches hooked up to ignition, seat and brake. It's powered by 8-hp engine.

Yard-Man grass catcher has 75-pound capacity, can be used with any of three riding mowers in the company's line.





When the rear bagger on Toro rider (left) is filled, all you do is lift dump lever and unit discharges from the bottom. The bagger has a capacity of 3¼ bushels.

Drain gas, disconnect the battery, and this Homelite rider is set for storage in garage for the winter. The 8-hp machine takes up nine square feet of floor space.



or deflector to keep spilled gasoline from the muffler area.

Since outdoor power equipment is a source of noise pollution, OPEI standards restrict walk-behind mow-

ers to 92 decibels and riding mowers to 95.

Check for all these points when you shop for a mower. The list of machines included with this article

is not intended to be complete. Because of space limitations, some makes were omitted. In any event, the list should convince you of one thing: Your choice is wide. ★★

You can build your own garden tractor from a kit

Why do some men choose to build a garden tractor from a kit? After assembling the 10-hp; gear-driven Heald Yard Bronc, I'd say a good-enough reason would be *for the fun of it*. The big thrill comes when you roll her out under her own power.

By doing the work yourself, you get a tractor of better than average quality for \$599.95. The heavy-gauge welded frame is completely rust-proofed and all parts are heavily plated. What's more, it's *your* tractor; you know what needs lubrication, how to make adjustments and how to install replacement parts when necessary.

The engine is shipped bolted to the frame. You merely hook up ignition wires and carburetor linkage. You work from a construction manual

that's numbered to correspond to an illustrated assembly sheet.

How long does the job take? It has been done in 10 man-hours, but I suspect that record was set by fellows at the factory who'd done it a dozen times. I took about 48 hours.

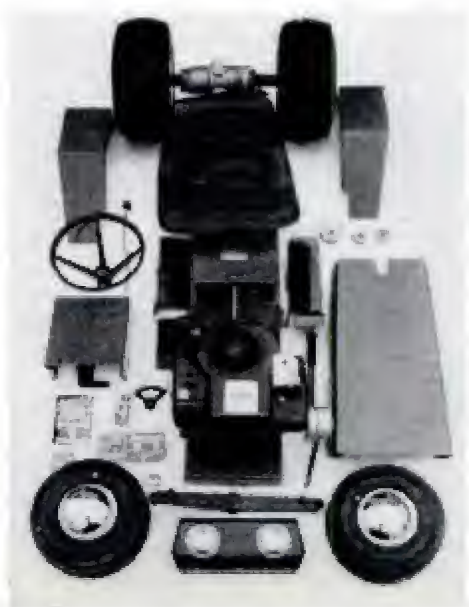
The tools needed for the job are pliers, screwdriver, Allen wrenches, a set of open-end or box wrenches, and a socket set with extension. We also recommend a soldering gun and snap-ring pliers.

The 10-hp engine has plenty of power for the 36-inch, three-bladed rotary mower, the 36-inch snow-thruster and the 42-inch dozer blade

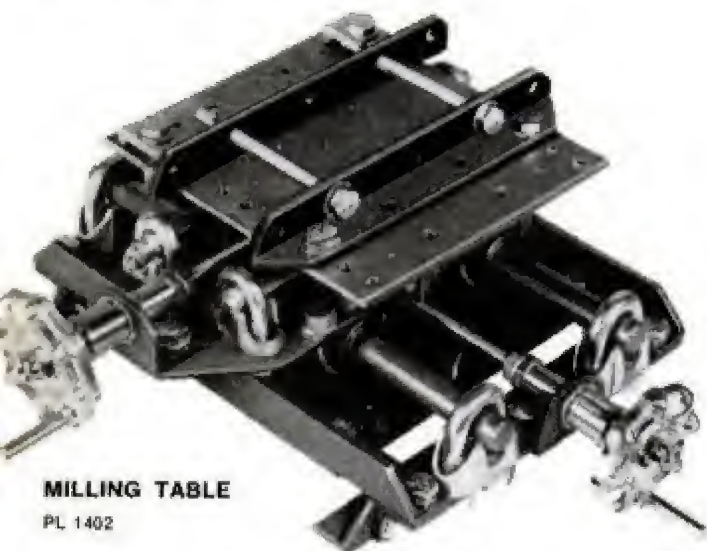
that are Yard Bronc accessories. The tractor has one design fault that's obvious when you're seated with your right foot on the brake-clutch pedal and the left on the footrest. Both legs rub against sharp metal. The right against the PTO clutch segment; the left against the lift lever segment. Both need to be padded to prevent bruised shins.

But when you build your own tractor it's your baby—so you're quick to overlook its faults and make much of its good qualities. It's that way with the Yard Bronc from Kits by Heald, Box 1148, Benton Harbor, Mich. 49022.—*Jim Liston*.

Heald Yard Bronc is assembled in 113 steps. Author felt experience of building made him better able to service machine.



Three shop tools you can build for very little money



MILLING TABLE
PL 1402

An ideal machine for model builders, electronic hobbyists and camera buffs. Built entirely of parts found in hardware, hobby and plumbing supply stores, this tool costs about \$30 to build from scratch.



BORING MACHINE
PL 1400

Since its appearance in Aug. '74, scores of readers have requested how-to-build plans for this pedal-operated horizontal boring machine. Now plans are available.



DRILL PRESS PL 1401

Drill press features a ball-bearing spindle, large adjustable worktable and good torque for drilling up to its 1/4-in. capacity. All parts are obtainable from hardware and hobby shops. Cost to build is about \$70.

In these days of soaring prices and eroding dollars, PM's editors are pleased to present three great shop machines that you can build yourself. The prototype tools shown on this page were created at costs of one-third to half the price of what their commercial counterparts currently sell for. Though they're admittedly not projects for beginners, anyone who has the time, inclination and skills can create all three tools at very big savings.

The boring machine is offered as a result of reader interest. Since the tool's appearance in PM in August '74 (see *A Modern Workshop in the Old West*, page 154), scores of letters asking for how-to-build plans have been received. We contacted Charles Kastl of Phoenix, Ariz., who designed and built the machine, and asked him if he would prepare the plans so that our readers could duplicate his setup. Those plans are now being offered for the first time.

His fellow Arizonian, Dick Cutler, did the drawings for the milling table and drill press after building the prototypes shown. Cutler says that "for pure pride of accomplishment, few things match the feeling you get when using a good tool that you've built yourself."

PM's editors would add: For a satisfied feeling when building a shop project, there are few things that match working from a clear set of plans. To order your set or sets see below.

★ ★ ★

PM PLANS OFFER

Each set of plans includes detailed drawings, separate instruction sheets and materials list. Price is \$6.95 per set or, three sets for \$15.85 (postpaid in both cases). Make certain you specify plan number when ordering. Checks and money orders should be made payable to Popular Mechanics and mailed to PM Plans Library, Dept. D5, Box 1014, Radio City, N.Y. 10019. Please allow two or three weeks for delivery.

BORING MACHINE: Charles Kastl
DRILL PRESS AND MILLING TABLE: Richard F. Cutler

No-gas, no-noise power boats

An underwater electric fan can remove sound, smell and fuel costs from your boating.

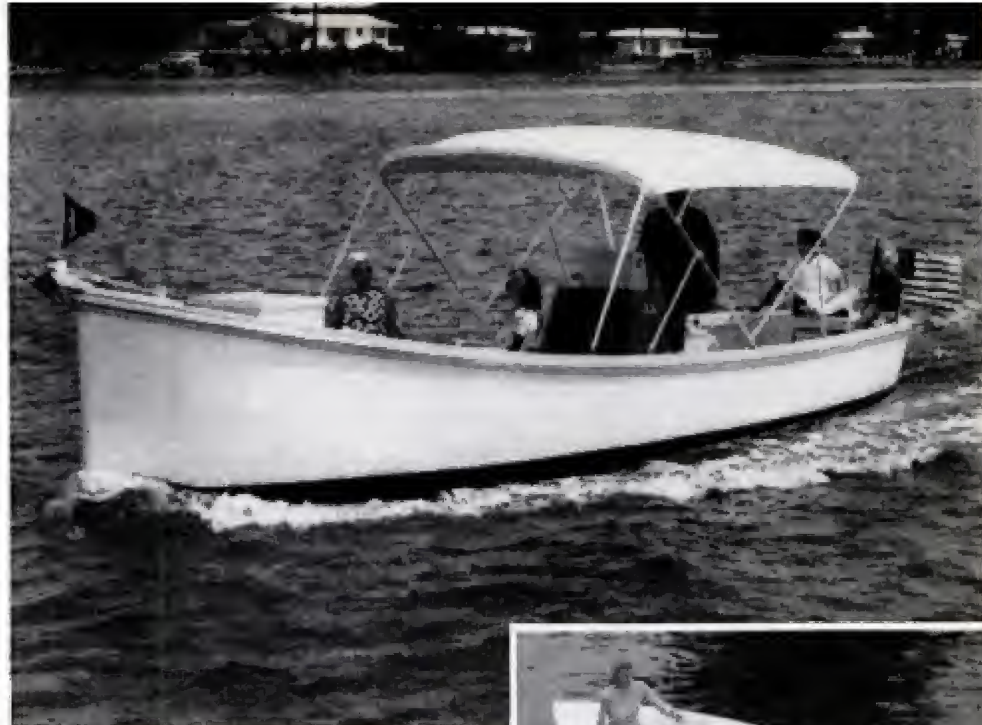
by William and Ellen Hartley

Boating without buying gasoline—that's the special appeal of craft that cruise silently away from the Branson Boat Co. of Port Salerno, Fla. Glide along for up to 100 miles with one of its 24-foot catamarans before you need to pull over, plug in and recharge again.

Norm Branson, an ultrasonic specialist with General Electric in Schenectady, N.Y., built his first electric boat during the 1940s. "I fixed a marine battery in a wooden boat," Branson remembers, "and used an ordinary permanent magnet motor. It wasn't much for a design, but it would fit any skiff and was great for trolling the local lakes."

Years later in the early 1960s when Branson settled on a quiet Florida bay called Manatee Pocket, he went back to his old hobby and started designing and building electric boats again, using narrow fiberglass displacement hulls. By 1972, he found other people wanted to buy his custom-built craft and started selling his 18-foot Electra.

The two heavy-duty marine batteries powering the Electra-18 are housed in a box keel and give the boat unusual stability with their combined weight of 400 pounds as ballast. They deliver 272 ampere hours at 24 volts, and will drive the $\frac{3}{4}$ -hp permanent magnet motor, also mounted in the keel, for about 30 miles at 5 mph. A solid-state speed control slows the boat to less than 1 mph, and Electra can extend its range up to about 12 hours at 3 mph before recharging from any 115-volt, 60-cycle outlet. The Electra-18 has a five-foot, six-inch beam, draft of one foot, weighs approximately 1100 pounds with bat-



Gliding along without fumes or vibration, Branson Boat Co.'s Electra-30 (above) can cruise 50 miles at 5 knots, 200 at 3. Electra-18 (right) has 36-mile range.



teries, costs about \$8000 built to order and ready to go.

Norm Branson has also designed 24 and 30-foot Electra models, an electric canoe, and an impressive 24-foot Electra-Cat with propellers in each of the twin catamaran hulls, providing a range of 30 miles at 6 mph, or 100 miles at 4. At some future date, Branson has considered marketing the catamaran molded hulls and electrical components as a kit.

Though originally designed for the quiet cruising and trolling of sheltered lakes and streams, Branson's Electra-30 has proved seaworthy in open saltwater as well. Anyone with mechanical ability, Branson believes, could build an electric boat, but it has taken him years to find the electric switches, components and accessories that can stand up to the corrosion and electrolysis caused by salt air and saltwater. His heavy-duty bronze propellers and rudders are sheltered in the long keel, and motor and batteries are protected by automatic bilge pumps, but any iron bearings, fastenings and electrical connections would be susceptible to rust.

Electric boats are not a new invention. The Electric Launch Co. (ELCO) built 55 in 1892 for the Chicago World's Columbian Exposition, and Duffield Marine in Costa Mesa, Calif., is another source for them today. The Morgans and Vanderbilts used to consider electric the perfect family picnic boat. It looks as if they're still right. ★ ★ ★



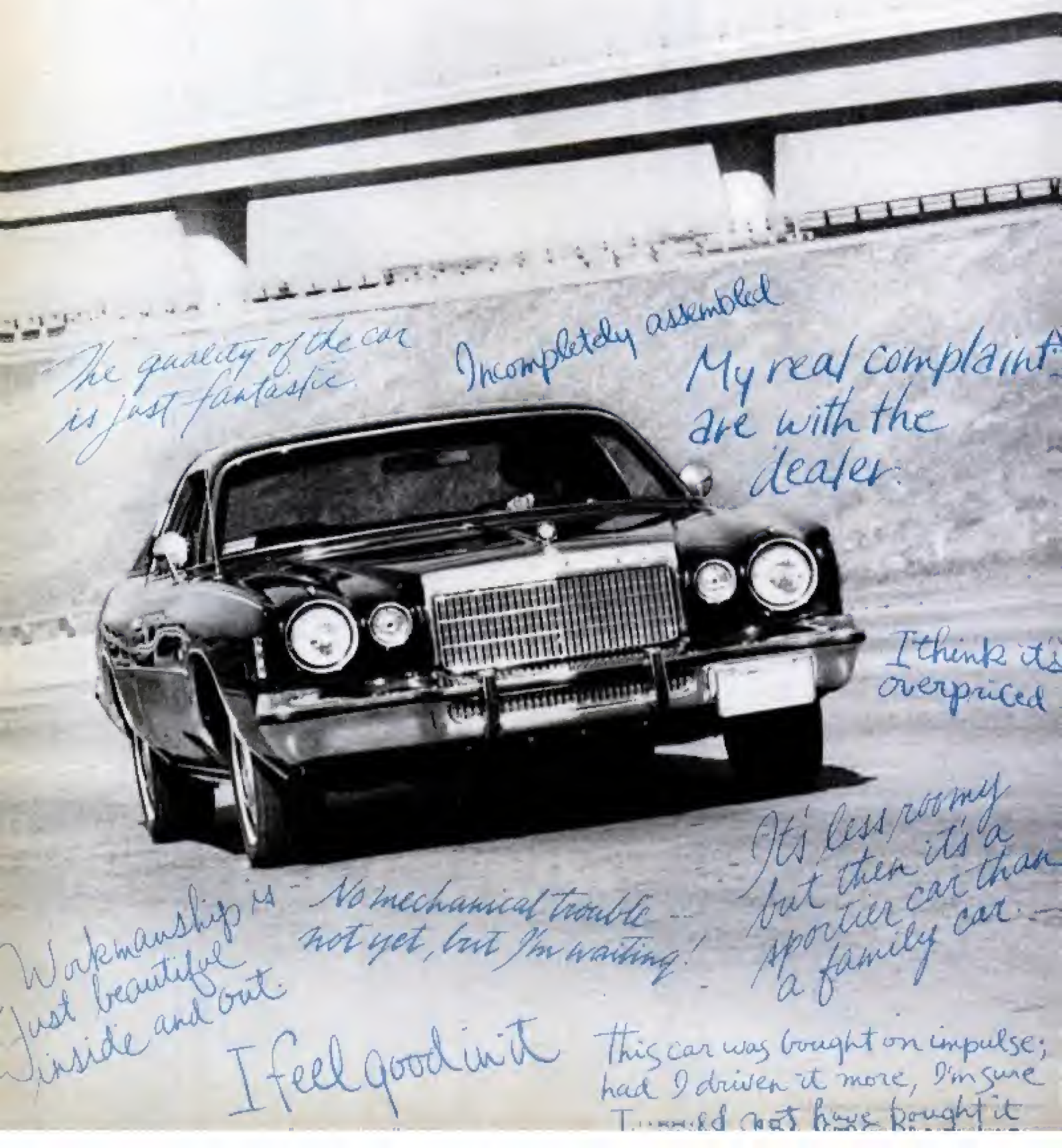
Power-packed keel of Electras provides both push and ballast. Batteries at top, automatic bilge pump plus switch, electric permanent magnet motor, shaft, fit neatly.

PM OWNERS REPORT: CHRYSLER CORDOBA

How well has Chrysler packaged prestige in its small and stylish new car?

A nationwide survey based on 1,000,000 owner-driven miles

by Michael Lamm WEST COAST EDITOR



The quality of the car is just fantastic.

Incompletely assembled

My real complaints are with the dealer.

I think it's overpriced.

Workmanship is just beautiful inside and out.

No mechanical trouble not yet, but I'm waiting!

It's less roomy but then it's a sportier car than a family car.

I feel good in it

This car was bought on impulse; had I driven it more, I'm sure I would not have bought it.

You'd be right in calling it a small Chrysler, but it's by no means a small car. If anything, it's an intermediate, sharing the 115-inch wheelbase of Dodge's Charger and Coronet and Plymouth's Fury.

Chrysler sales people have an interesting theory that goes something like this: They feel that small-car owners move up to intermediates as their families grow. Owners of large cars trade down to intermediates as the price of gasoline goes up. So eventually everyone drives an intermediate. Which is part of the reason Chrysler decided to bring out a nameplate in that category.

The Cordoba shares its body, panel for panel, with the 1975 Dodge Charger. Except for trim and interior differences—plus about \$150 more on its showroom sticker—the Cordoba is the Charger (or vice-versa). It's hard for most people, even auto buffs, to tell the difference without reading the nameplate. As it happens, both cars use the same engines, power trains and mechanical components. Engine choice includes V8s of 318, 360, and 400 cu. in., the 360 two-barrel being standard with a 2.45 rear-axle ratio.

What do owners think of their new Cordobas? Our summary chart (page 86) gives the consensus. We queried 1000 Cordoba owners, and the following comments, representing over a million miles of driving, give a fair cross section of responses.

A 27-year-old Roanoke schoolteacher notes, "I wasn't going to trade cars until I saw the Cordoba. I'm completely satisfied. Ride, silence, handling, looks and styling are all great, and performance is much better than I expected. The only trouble so far was a defective cruise control. The dealer lent me a new car to use while they were fixing mine, and my Cordoba was ready when they promised it."

Writes a New Jersey postmaster: "Have owned Chrysler cars since 1955, and I wanted an intermediate this time. It has more power than the Granada, which I also tried. I find that the Cordoba's power steering does not function as easily as our 1967 Chrysler's. But that might be remedied at our first servicing. I especially like the way the Cordoba holds the road at all speeds. It rides smoothly and quietly, but most of all it's a beautiful-looking car."

Here's a Texas rancher: "I was sold by the Cordoba's styling and traditional Chrysler quality. However, I feel the workmanship on this car is poor. The digital clock had to be changed three times. I also had problems with

It's the dealer who has to make right all things that were made wrong at the factory.

The latest word game is naming the new "small" cars. Next month, "international in size" joins the list to "define" the new "small" Cadillac.

Many owners hadn't realized the Cordoba/Charger similarity, and weren't too happy when they found out.

Chrysler's move to a smaller car is partly in anticipation of Cadillac's intermediate.

Most owners like Cordoba's performance. Ironically, "economy" 318 V8 option gets same mileage as standard 360.

The rotten egg smell sounds funny but is deadly serious. Sulfate emissions from catalytic converters may be a health hazard. The Environmental Protection Agency (EPA) is investigating.

door alignment, steering-wheel alignment, trim alignment, wind noise, poor sealing in the muffler, a torn front seat, water in the parking light, speedometer noise, and a few other things. I repaired some of these items myself, and I had to touch up the trim where the dealer scratched it while installing the clock. If I were buying a car today, I'd get an Eldorado. The Cordoba is comfortable, but the rear seat needs to be larger, and factory quality control plus dealer service needs improving."

From a New York electrician, "Our Cordoba serves both as family transportation and as a drive-to-work car for my wife and myself. I drive it primarily on a 25-mile round trip plus short runs in town. I firmly believe that the intermediate-sized car is large enough for any purpose. This car gives us that size plus true luxury for traveling. Its predecessor was a 1973 Plymouth Road Runner 318. The Cordoba equals the Road Runner in gas mileage—20 mpg on trips and 16-17 mpg around town. It's better riding and in roadability. I rate workmanship as good to excellent, and I've done business with the same agency many years. They've always given prompt service, even on warranty, and have allowed good trade-in value."

Then the following comments by a 21-year-old copy machine company employee in Webster, N.Y.: "Looks and elegance sold me the car, and the only problem in 3480 miles was too high an idle speed, which the dealer adjusted in a few minutes. This dealer is tops—better than the MG and Olds dealers I've dealt with before. I'm sold on the looks—very sleek—and the power: zero to 80 mph in about 15 seconds. No kidding, it handles like a sports car. Only two complaints: The catalytic converter smells like rotten eggs, and my floor shifter isn't locking in park. Workmanship is of the highest quality."

A 33-year-old Michigan broadcaster puts it this way. "I looked, drove it, and loved everything about it. I might add that I wasn't in the market for a new car. This one, for its size, has the quality of a much bigger car, and the elegance. I had Lincolns for 10 years, and this car rides just as nicely, but quieter. All it needs is more legroom and headroom in the back seat."

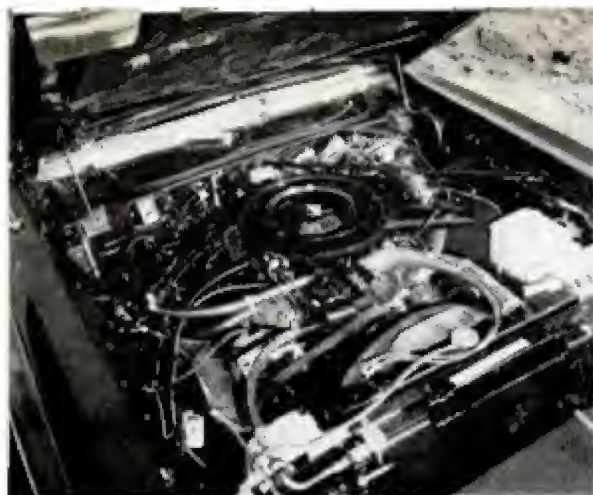
A Kansas City attorney, not so pleased, said, "I had thought that by buying a smaller car I would save on gasoline, but this one uses more. The engine has dieselized since new, and when it does, it puts out a terrible odor. I've

had it back many times, but the dealer cannot seem to fix it. I also find both front and rear seats uncomfortable, especially with so little room in back."

Counters an Illinois sheet-metal technician: "I was surprised at the Cordoba's ride. It gives a soft, smooth ride without that jelly-bowl feeling so many other luxury cars have. The solid

Cordoba owners tell about their cars on facing page. From top left (clockwise) are remarks from the following: Indiana warehouseman, Illinois union representative, Kansas clerk, Michigan farmer, Illinois letter carrier, Alabama race driver and maintenance superintendent, New York man, Michigan sales vice president, New Jersey teacher.





Fuel economy for the 318 and 360-cu.-in. V8 engines is almost the same, averaging about 15 mpg.



Cordoba trunk came in for much criticism from the owners: it's too small and spare gets in the way.

suspension and 15-inch radial tires are a terrific asset. And the split front bench seat we chose, with the folding central armrest, affords plenty of room for six passengers."

An Illinois computer operator: "Handles and performs very well, with good gas mileage—up to 19 mpg. I've had more double-takes, compliments and comments on how beautiful and different this car is! The only thing I'd like to see changed is the hideaway wipers. They're a hazard and should be eliminated from all cars."

A Virginia textile mill manager confesses, "I think all American cars are good, so I buy strictly for looks. The Cordoba combines good appearance, a solid ride and good gas mileage. The only thing wrong is the pickup, which is probably remedied by the 400-c.i.d. engine (mine is the 360 two-barrel). But you can't have it both ways."

"People say it's a nice car but overpriced," observes a Chicago salesman, "but I disagree. I feel Chrysler has, for the first time, offered an intermediate with as much style and class as a \$12,000 auto. I'm glad the price is a little high—that way I can maintain a certain kind of individuality. I used to drive a Cadillac Sedan de Ville, but I'll never buy another one, because it seems everyone has one."

From a Massachusetts salesman: "It needs a bigger trunk. I put samples back there, and there's not enough room. What I especially like

Lots of praise for Cordoba's combination of good ride and fleet-footed handling.

Most owners know that the back seat is for short trips or kids only.

He doesn't mind the price so long as he doesn't meet himself at every red light.

Trunk space would be better if the spare tire could be better located.

about the Cordoba is that it looks so good. It also holds the road well when taking curves, and it's a solid all-around car."

And a Wisconsin librarian whispers, "We used to have a Lincoln Mark III; couldn't see paying \$12,000 for a new one; liked the Cordoba's interior especially. It's not quite the car the Lincoln was—little flaws in the paint and slightly wavy side metal. But very comfortable in front and comfortable enough in back. Still, the trunk doesn't fit well, nor the hood."

Suggests a Phoenix computer analyst: "I would like disc brakes front and rear; also the spare could be repositioned for better space utilization. I bought the car on the basis of looks plus Chrysler's reputation for engineering. Mechanically the quality is very good, but the paint and vinyl top need some touching up. Comfort in the front seat is on a par with my previous Olds 98, and the back seat isn't bad for shorter trips. If Chrysler would only learn that excellent design must be executed beyond the engine and running gear."

Finally, a parting pat on the back from a Jersey materials specialist. "Chrysler's warranty is the best to date and covered my Cordoba's cracked brake drum. More than that, though, I believe the Cordoba is the best car to come out in 50 years, bar none. Other makers should look over the Cordoba so they, too, can learn how to make great cars." ★ ★ ★

Summary of 1975 Chrysler Cordoba Owners Reports*

Total miles driven 1,191,561

Average miles per gallon:

318-cu.-in. V8: Local driving 13.7
Long trips 16.9
360-cu.-in. V8: Local driving 13.5
Long trips 17.2
400-cu.-in. V8: Local driving 11.9
Long trips 15.1

Engines:

318-cu.-in. V8 21.3%
360-cu.-in. V8 70.5%
400-cu.-in. V8 8.2

Why the Cordoba?

Styling 78.8%
Size 14.9
Past experience 7.8
Handling 4.9
Economy 6.6

Specific likes:

Styling 69.3%

Handling 48.4
Comfort 32.0
Economy 22.0
Performance 10.6

Specific dislikes:

Trunk too small 14.5%
Poor gas mileage 11.7
Workmanship 9.1
Dealer service 8.8
Not enough headroom 6.3
Not enough legroom 6.3

What changes would you like?

Bigger trunk 20.1%
More legroom 13.5
More headroom 8.0
Better workmanship 6.2
Tilt steering wheel 5.9

Number of vehicles owned:

Cordoba only 47.5%
Two cars 40.5

Three cars 8.6
Four or more cars 3.6

Other cars owned:

Plymouth 21.0%
Chevrolet 18.2
Dodge 14.2
Chrysler 13.1
Ford 8.6
Volkswagen 6.8

Comfort opinion:

Good to excellent 79.7%
Average to poor 15.2

Workmanship opinion:

Good to excellent 70.4%
Average to poor 26.9

Dealer service opinion:

Good to excellent 77.1%
Average to poor 22.9

Had any mechanical trouble?

No 56.9%
Yes 43.1

Type of trouble:

Electrical 17.0%
Carburetion 11.6
Oil leaks 6.1
Transmission 5.4
Speedometer cable 5.4

Did you repair it yourself?

No 98.6%
Yes 1.4%

Dealer repairs satisfactory?

Yes 66.4%
No 33.6

Age distribution of owners:

15-29 years 31.6%
30-49 years 43.0
50-plus 25.2

Would you buy another Cordoba?

Yes 83.8%
No 16.2

*Percentages might not equal 100% due to rounding or insufficient data.

The plane that makes anyone a pilot

by Sheldon M. Gallager
EXECUTIVE EDITOR

PM tests a homebuilt glider you can legally fly without a license. All you need is a towboat for fabulous fun.

There was a roaring rush of water as the twin floats pounded over a slight chop. I was sitting in a small cockpit between the floats only inches above the surface and could feel the slap of waves against the underside of the fuselage. It was scary. As my speed increased, a sense of apprehension began to creep over me—was I an idiot trying to fly something I hadn't even seen before?

It was now or never. I hauled back cautiously on the control stick and then it happened—one of the most exciting experiences of my life. The nose came up, the rush of water died away and there was a strange, eerie silence. Looking down at the rapidly receding water, I suddenly realized I was airborne. Flying. Actually fly-



Photos: Howard Levy



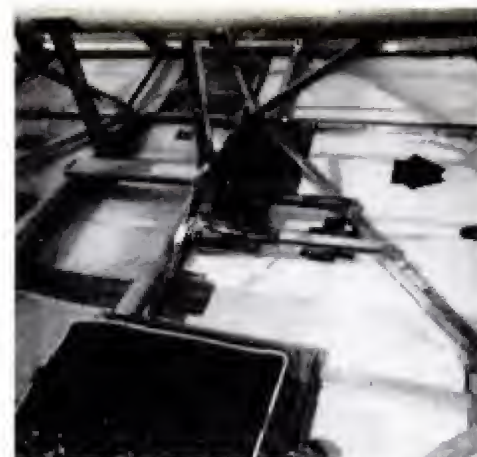
Author in first test flight above proves that even an inexperienced pilot can handle the Sea Sprite tow glider with surprising ease. Lift-off (top photo) begins at about 25 mph. As boat speed increases, ship climbs rapidly to an altitude of 50 to 60 feet (center, right), then swings smartly off in a gentle banking turn (lower right). Ideal cruising speed is between 35 and 40 mph, though you can have plenty of fun and action at lower speeds with towboats of moderate power.





With wings and tail folded, glider can be easily trailered to and from water. Note teardrop shape of fuselage—itsself an airfoil for good aerodynamic characteristics.

Simple one-piece tail pivots up and down as unit, functioning as elevator without need for separate elevator panels. Vertical stabilizer is fixed, having no rudder.



Cockpit view shows single, centered control stick just ahead of seat cushion. It moves sideways for aileron control, forward and backward for elevator control.

ing! Alone in the air by myself for the first time. The sensation was almost unbelievable.

The craft I was flight-testing for PM represents a brand-new concept in water sports—a small, one-man glider designed to be towed behind a speedboat. Called the Sea Sprite, it's the brainchild of aircraft designer Thomas H. Purcell of Raleigh, N. C. What's intriguing about it is that, under FAA rules, it can be legally flown without a pilot's license so long as you remain attached to your towboat and stay below 200 feet. Thus anyone can enjoy the fun and thrills of flying without a license and at relatively little cost. You can build the Sea Sprite from Tom's plans for about \$400.

That anyone can fly it is what I was there to prove—or try to. I've had some copilot experience in engined craft, but have never flown

solo or even been in a glider. So as far as this particular bird was concerned, I qualified as a genuine novice. I could tell Tom agreed because he had his fingers crossed as I climbed in the cockpit and he may have been mumbling a silent prayer. I was flying his prototype—the only one he had. We had already wasted two days waiting for decent weather with a hired chase plane standing by for aerial photography. So the stage was set for what could be a very costly misadventure if anything went wrong. The old butterflies-in-the-stomach were working overtime.

Back upstairs, I was gloating over my successful takeoff when it suddenly occurred to me that what goes up must come down. It was time for my first landing, and that earlier apprehension began to return. I tried to remember everything Tom had told me: Don't dive her or you'll come in

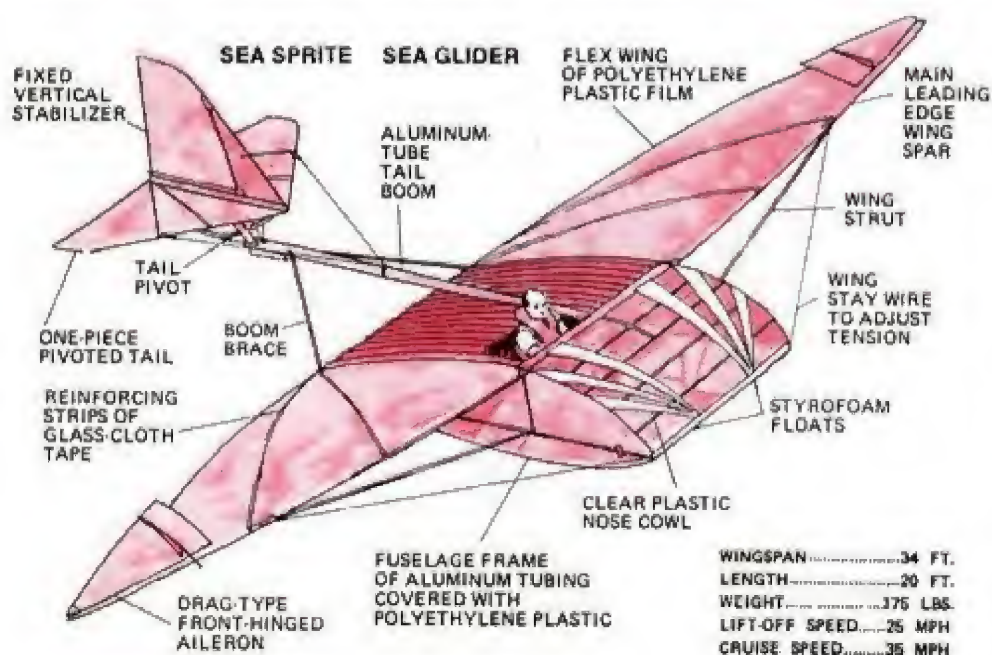
too fast; don't pull up too sharply or you may stall out; don't drop a wing near the water or it may dig in and snap off.

I eased the nose down and signaled the towboat to reduce speed. The water started coming up—a little fast, I thought—but the approach was smooth and felt good. I was right on target until the last minute when a gusty crosswind caught the craft and swung her sideways. I was crabbing, with no time or altitude left to straighten out. For a moment, I had a fearful vision of what might happen when the floats hit the water at an angle. Would they dig in and flip me? To my surprise, the glider settled gently into the water and immediately swiveled around to track perfectly behind the towboat.

Later, Tom explained he had deliberately designed it to be self-tracking, knowing that pilots would occasionally get caught in a crab landing. This is just one of several features that make the Sea Sprite safe, easy and fun to fly.

Basically, the craft consists of a tubular aluminum framework covered with a "skin" of polyethylene plastic film. This makes it surprisingly light for its size—only 175 pounds. Overall length is 20 feet, the wingspan 34. The fuselage section is supported on floats carved from Styrofoam blocks. The wings are flexible and are merely pieces of polyethylene attached to leading-edge spars with their trailing edges held taut by stay wires. At rest they droop, but in flight they billow out and fill with air, providing tremendous lift—like an umbrella caught in a stiff wind. Wings and tail fold for easy trailering of the craft to and from water.

Several clever touches keep con-





Ready for test flight, author checks out glider's controls. Correct trim adjustment and stay-wire tension are important for proper lift, stability and easy handling.

Wingtip allerons work on "drag" principle. As one is raised, it causes wing on its side to slow slightly because of air resistance, forcing ship to bank that way.



Weighing only 175 pounds, glider is readily carried into and out of water by two persons. Air view below, shot from plane, shows what it's like to soar 60 feet high.





Air horn by Marchal, \$33.



Dashboard by Accessory Distributors, \$33

Aluminum rear sprocket by Circle Industries, \$13.



Bolt-ons for your bike

By Bill Hartford AUTO EDITOR

Run up the revs and lay it into the next sweeping bend. You've got fuel for 200 more miles, a fork to soak up the shocks and you're looking good! There's more to your machine than they ever saw at the factory. You may have thought your showroom stock motorcycle was pretty exciting, but when you add these accessories, you'll have a bike that'll really give you a run for your money.

Comfort, appearance, performance and safety accessories are available at all motorcycle dealers and from outfitters like Outrider Accessories, Inc., where we assembled those shown here.

See what a few fine touches can do to increase your riding pleasure. ★ ★ ★

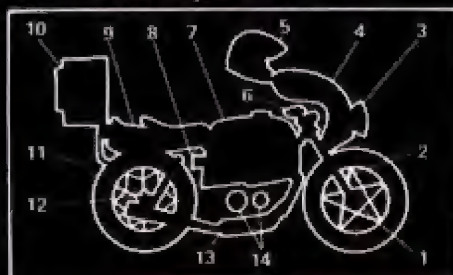
Photos: Ben Rose
Producer: Irv Dolin

1. Cast magnesium "star mag" wheel by Yamaha, \$110. 2. Road-race forks by Ceriani, \$180. 3. Quartz-halogen headlight by Marchal, \$25. 4. Quarter cafe fairing by Read-Titan, \$75. 5. Don't forget a helmet: Arai RX-7, \$60. 6. Clip-on handlebars, grips, levers by Tommaselli, \$56. 7. Touring tank by Read-Titan, \$90. 8. Velocity stack by Beck-Arnley, \$5. 9. Touring saddle by Custom Contour Seats, \$180. 10. Rider rack by Whitco, \$50. 11. Cast magnesium "snowflake" wheel by Kimlab, \$155. 12. Shocks by Ceriani, \$50 pair. 13. Exhaust system by Bassani, \$140. 14. Decorative clutch, points and dyno covers replace originals, \$10 to \$25.

Foot pegs by Accessory Distributors, \$12 pair.



Case-hardened chain, Campbell, \$30, and padlock by American Lock, \$35.



Spring checklist for your motorcycle

by William Hampton



Spring clip on master link should have open end trailing (arrow shows direction of chain travel).



Top off battery with distilled water, wrap old inner tube around it to absorb riding vibrations.



Drain oil from engine after it's at operating temperature. Paper-towel tube prevents splashing.



Chain tension is checked midway between engine and rear sprocket.



When lubricating chain with nozzled applicator, place tip against the sprocket so oil runs down to the linkplates.



Chain wear can be checked quickly by pulling the chain off the rear sprocket teeth at the axle level.

A thorough cleaning and polishing of your motorcycle is usually a springtime labor of love—and like love it comes naturally. But for the tougher nut-and-bolt adjustments, you need a checklist. Here's a list which, if followed like a road map, will assure your making all the necessary checks. Working from front to back, there are six major areas with subassemblies, which should command your attention.

☐ Start at the front-wheel assembly. Check air pressure of the tire. Look for breaks in tread and side walls. How about spokes? Tighten loose ones.

Grasp the front wheel with both hands and shake it to detect worn or loose wheel bearings.

Take a wrench to the axle or axle-cap nuts to make sure they're tight. Fender braces tight? Check these, too.

With your bike on the centerstand, squat down in front of the wheel and shake the fork legs forward and backward. Any play in the fork-leg bushings and/or steering-head bearings will be noticeable.

If a drum brake is fitted, make sure the cable from the handlebar lever is securely attached to the brake's cam lever. If it's a disc brake, make sure the hose and line connections are tight.

☐ Now check out the handlebar assembly. Lubricate the cables to the clutch, front brake and throttle. For convenience, use one of the injector-type lubricators. Use the clutch cable adjuster so that about 1/8-inch of cable is exposed near the end of the handlebar lever before the clutch plates start to separate.

Adjust front-brake cable (drum brake) so that the hand lever moves about a third of its travel before the

brake bites. Make sure the throttle cable doesn't bind.

If you're sitting on the seat, you can determine play in the steering-head bearings another way: Apply the front brake and place the fingertips of your left hand over the gap between the steering head and the bearing cap. Now rock the bike forward and backward. If there's any excess play, you'll feel it with your fingertips. If you have to tighten up the bearing cap, don't overdo it; the fork should turn easily from side to side.

Check the wiring harness where it goes around the steering head. Inspect all lights, switches, wiring and snap connectors.

☐ Check your battery, too. Unless you've been running your bike, an inactive battery discharges quickly. If it needs a boost, use low-ampere charging (1-3 amps.).



Control-lever screw should be tightened so that lever has minimum sideplay without binding when it's squeezed. As lever is squeezed back, check for frayed cable strands at cable-end fitting.

Rear-wheel alignment can be checked by measuring distance from axle to swing-arm pivot on both sides of the motorcycle.



Footrest mountings must be tight. Check all of them periodically.

Steering-head worn or loose bearings can be detected by placing fingers over gap between bearing cap and steering head. Apply front brake, rock bike and feel play at gap (arrow).



Wheel-bearing wear and wear of swing-arm bushings can be detected by grasping the rear wheel on both sides and shaking it.



Play in fork-leg bushings and/or steering-head bearings can be detected by shaking fork legs.

□ Drain the gas tank and carburetor. If the bike has sat around awhile, the carburetor may need cleaning.

Check out the various nuts and bolts in the engine area. Pay particular attention to the engine mounts, head stay and upper-frame tube. If they're loose, they'll really give your bike the shakes.

Be sure to use a torque wrench on the alloy cylinder head. Don't overlook the footrest mounts.

Drain the main oil supply and replenish with fresh oil. The same goes for the gearbox and primary chain-case reservoirs, if your bike has them. You might change oil in fork legs, too. Don't overlook grease fittings.

□ Inspect the rear wheel/tire assembly the same as you did the front wheel/tire. If you shake the rear wheel hard enough, you'll also be able to tell if the swing-arm bushings are worn. Adjust and lubricate.

Chain play (up and down movement) is determined midway between the gearbox and rear-wheel sprockets, at the chain's point of maximum tension. If both tires are on the ground, roll the bike backward or forward until the point of maximum tension can be found. With your weight on the seat, allow at least $\frac{3}{4}$ -inch play. If the bike is on the centerstand so the rear wheel is off the ground, allow about $1\frac{1}{4}$ to $1\frac{1}{2}$ -inch play. With weight off the rear tire, the chain "relaxes" more, so allowance must be made. When adjusting the chain, turn each wheel adjuster an equal number of turns or "flats."

□ Lubrication: A dry chain wears faster and robs power from the engine. A few tips about lubrication: Never apply the lube onto the middle areas of the rollers; it'll never do any good there. Instead apply it to the edges of the linkplates, so it can find

its way down into the areas between the pins/bushings/rollers.

An adequately lubricated chain also absorbs shock, helping to make the bike run more smoothly.

You can quickly test for chain wear by grasping the chain at axle height and pulling it off the sprocket teeth. If it lifts off more than two-thirds the height of the teeth, replace it.

□ Look at the rear-wheel sprocket. If its teeth are hooked, pointed or, worse yet, worn to nubs, replace the sprocket. The gearbox sprocket will fare worse than the rear-wheel sprocket, because it's the driving member. It's usually a good idea to replace both sprockets together.

Moreover, never run a new chain with worn sprockets and vice versa.

Don't forget to tune the carburetor, set the ignition timing and adjust the valves to complete the spring-time check of your machine. ★★



Swank furniture from slip-together tubing

Virtually any shape you want can be made with this slip-together tubing that looks like metal but is really metallized plastic. It can be cut easily and joined with matching connectors to form contemporary supports for shelves, tables, other furniture. Mirron 1 1/4-inch tubing comes in 4-foot lengths in chrome, gold, brass and five colors. For nearest dealer, write Thermoplastic Processes, Valley Rd., Stirling, N.J. 07980.

New water-sport thrills: Seagoing 'motorcycle' skims waves at 40 mph

Riding the waves on a seagoing bucking bronco may become a wild new water sport if this Hydrobike catches on. Handling more like a waterborne motorcycle than conventional speedboat, the unusual craft is designed to take outboard engines from 15 to 25 hp and is capable of speeds up to 40 mph. While machines of this type aren't new in concept, this one sports a special feature—as speed increases, it rises almost completely out of the water, supported on hydrofoil "wings" near the stern. The foils permit higher top speeds as well as smoother riding even in choppy water since the hull doesn't touch the surface. They also make possible exciting climbing, diving and banking maneuvers. The Hydrobike was developed by aerospace engineer William Peschel of Venice, Calif. He hopes to put it on the market soon for about \$650 without engine.



Bike bags from kits save money, are fun

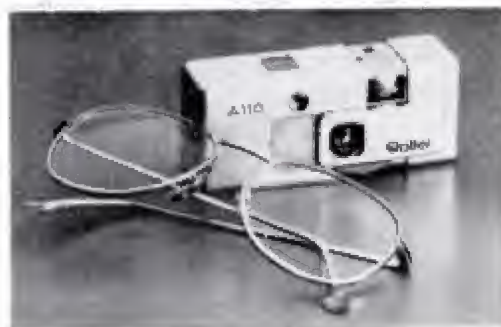
You can save up to half the cost of bike bags with these colorful kits you assemble. Kits include precut material, straps, zippers, fittings, thread—everything but the sewing machine. Kits of 7 1/2-oz. water-proof urethane-coated nylon are seat bag, about \$5.50; handlebar bag, about \$6; panniers, about \$16; in orange or green. Frostline Kits, 452 Burbank St., Broomfield, Colo. 80020. This cyclist wears ready-made Cool Gear Gran Sport shirt, \$11.75 from Jacobs Corp., 5735 Arapahoe Ave., Boulder, Colo. 80303.





Cradle finds centers of rounds, squares fast

Quick, accurate center location for both square and round turning stock is provided by Spider Centering Cradle. Trough of all-metal cradle works like combination square with a centering head: Draw or scribe line along blade, turn workpiece and draw second line. Intersection marks center. Handles squares from 1/4 to 10 inches, rounds 1/4 to 11-inch diameter; \$22.50 ppd. from Turn-O-Carve Tool Co., Box 8315, Tampa, Fla. 33604.



Roomy luggage carrier for two-wheel shopping or touring

Big enough for two full grocery bags, this king-size bike luggage carrier is handy for shopping chores as well as touring. Called Companion, it's molded of rigid yellow polyethylene, waterproof, lockable, theftproof. \$34.95, Perry-Scott Products, Inc., 11333 Roosevelt Way N.E., Seattle, Wash. 98125.



Pocket 110 cameras deserve (and get) a brighter, closer look

As cameramakers get more accustomed to the 110 pocket-cartridge format, their designs grow more sophisticated. For example: Keystone's Pocket-Matic 303 (top) has close-up lens for shots from 3 to 5 feet; Canon's 110 ED (bottom) has rangefinder focusing from 7 1/2 inches to infinity and an f/2 lens—and can print the date on a corner of each picture. Rollei's A110 (center), the smallest, collapses further between shots; electric eye works on flash, too.



Germany builds its first fighter since World War II

Germany finally has a fighter it can call its own—at least partly its own. The jet displaying the Imperial cross was jointly developed by German, British and Italian interests and will be adopted by all three nations in a program designed to standardize Western European military hardware. Up until now, the revitalized German Luftwaffe has been purchasing foreign aircraft, such as U.S. Lockheed Starfighters.



Steam power beats pedal power any day

Steam power is showing up on a lot of experimental vehicles these days, so why not on a bicycle? Students at Illinois Institute of Technology decided to try the idea as an engineering project and came up with this unusual steam-driven two-wheeler that does up to 20 mph. Boiler is located on left side of rear wheel, water tank and condenser on right side. Propane is used to heat the water (the students figured a wood-burning bike might be a bit too cumbersome).

Do-it-yourself repair kit for leaky flush valves

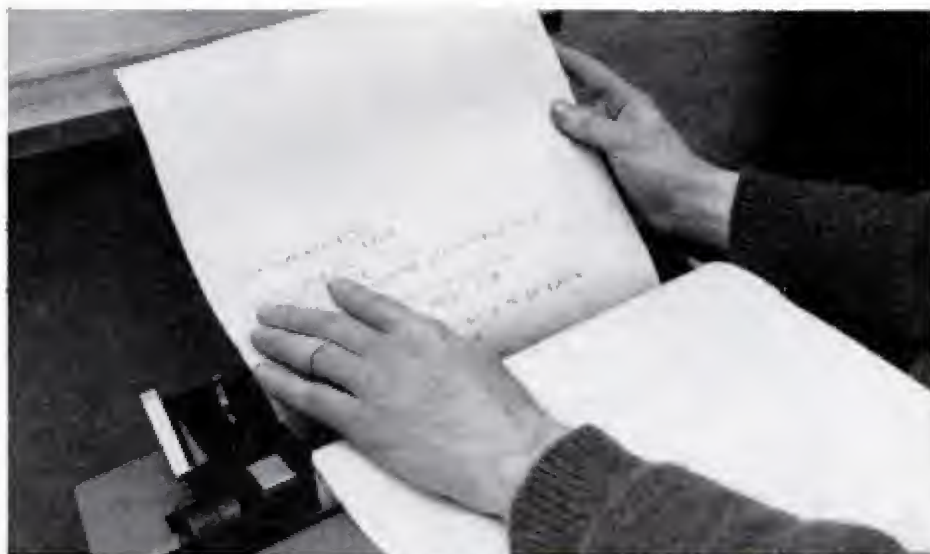
Fluidmaster Flusher Fixer Kit eliminates water waste and noise produced by a worn or misaligned toilet-tank flush valve. Kit replaces the old tank ball or flapper, and includes a new stainless-steel seat (fits conventional 2-inch assemblies) that's permanently aligned with the new flapper. Ball chain to replace old lift wire or chain is also in kit, as is sealant that cures in water. Flusher Fixer installs without removal of tank. Under \$5. Fluidmaster, Inc., 1800 Via Burton, Anaheim, Calif. 92707.



No excuse for getting lost: Locking compass now makes it simple to take sight bearings

Taking compass bearings is easy and accurate with this new sighting instrument because you don't have to line up a distant object and try to read the direction at the same time on a moving, jiggling compass card. You sight the object through a viewfinder, then release a button that locks the card at that setting. For hunters, campers, boatmen and other outdoorsmen, it has built-in illumination for night use. \$69.50, E. S. Ritchie & Sons, Pembroke, Mass. 02359.





Two new aids for the blind: Braille computers, braille maps

Computers do many remarkable things, but the one at top goes a step farther than most—it provides print-outs in braille that, along with a braille keyboard, permits blind persons to become computer programmers. Even more astonishing: It was developed by a blind engineer, Tony Brown, of Melbourne, Australia. Lower photo shows new plastic road maps in relief with braille markings for the blind to follow when walking. British Industrial Plastics, Box 11, Tat Bank Rd., Warley, England.



Security lockset for exterior doors

Although it's installed without mortising, like a fast-set lock, this lockset offers extra security with its hard-to-pick, 7-pin tubular-key cylinder. Dead-latch tab on night latch prevents defeat with credit cards. Interior knob has locking button, but is always free for emergency exit. \$23.95 list in brass or bronze, \$25.35 in chrome, from locksmiths, hardware and building-supply dealers. S. Parker Hardware Mfg. Co., 27 Ludlow St., New York, N.Y. 10002.



You don't need a match with this battery-run gas igniter

Matchless Gas lighter uses a replaceable glow-coil filament, similar to those installed in many appliances, to ignite natural gas, propane or any other flammable gas. Works anywhere, even in wind and rain. Long neck makes oven lighting easy. Maker says coil cannot burn user or start fires. Takes two C batteries. \$2.98 postpaid (batteries not included) from Lanzi Enterprise of America, 108 Stephens Pl., Staten Island, N.Y. 10306.

Tape measures get larger and smaller

Stanley Tools offers the first tape rule with a blade 1 inch wide—and a miniature that's always handy because it's on a key chain. The big Powerlock, with a 25-foot blade, will span openings up to 7 feet without buckling. Yellow Mylar-coated blade has stud markings every 16 inches. Case has power return, thumb lock and belt clip; \$10.25 suggested list price. Key tape miniature has 1/4-inch blade 3 feet long; \$2.79 suggested retail. Stanley Tools, The Stanley Works, 195 Lake St., New Britain, Conn. 06050.





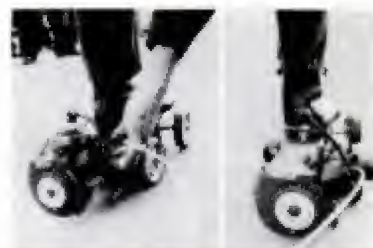
One finger tunes new TV sets

No more knob-spinning to tune these new TV sets. Zenith (top) lets you run a slide control to any of 14 preselected UHF and VHF channels. MGA's mode (center) has individual buttons for each of its 14 preselected channels. And Magnavox's STAR tuning system (bottom) lets you push numbered buttons to dial 82 channels as you would on a pushbutton phone.



Portable low-voltage pool light for safe, easy underwater illumination

Dramatic lighting for swimming pools can be had safely and easily with this portable power pack and low-voltage submersible lamp. The rechargeable pack provides 12-volt current for four hours of continuous use—enough for a full evening of swimming. You then recharge it overnight from a wall outlet and it's ready for the next night's use. Built-in safety features prevent overcharging and make it impossible to use the pack while still plugged into a 117-volt source. The sealed-beam lamp hangs from the edge of the pool and can light an area up to 20 by 40 feet. The pack can also power portable TVs, radios and other 12-volt appliances. Called Aqualite, it's \$119.95 from N. A. Taylor Co., Gloversville, N. Y. 12078.



Fast feet: 45 mph on motorized roller skates!

One way to beat the high cost of transportation is on foot—but motorized feet are even better. These gasoline-driven roller skates get their inventor, Bob Naranto, around town at speeds up to 45 mph at 50 miles to the gallon. Each skate is powered by a 1-hp engine and has clutch, brake and throttle controls.

Wonder of wonders: A new, cheap pocket radio that works—silently

There's nothing at all sensational about this little pocket radio from RCA—except that it works surprisingly well. It looks good, too, in beige with brown leather-like trim. Because it works only with a permanently attached earphone, it won't bother anybody else around. And best of all, the price is just \$5.





Early birds of aviation: Two antique copies of famous firsts

Recreating old aircraft is becoming a popular hobby, but few builders go as far back into early aviation as famous antique restorer Cole Palen did for the two ancient replicas shown here. At top is a 1910 Hanriot; at bottom a 1912 Deperdussin, both of French origin. Both are scratch-built copies since none of the originals exist to restore. The Hanriot has no ailerons and uses "wing warping" for banking. It has two control sticks—a warping lever that moves sideways and a fore-and-aft for elevator (you had to be pretty well coordinated to fly this baby). Cruising speed is a brisk—for those days—50 mph. The more sophisticated Deperdussin—first plane to exceed 100 mph—sports a "modern" wheel-type control column, is powered by a 160-hp Gnome rotary. Original set three speed records in 1913-14.



Recharging stations for electric motorbikes keep power up, fuel costs down

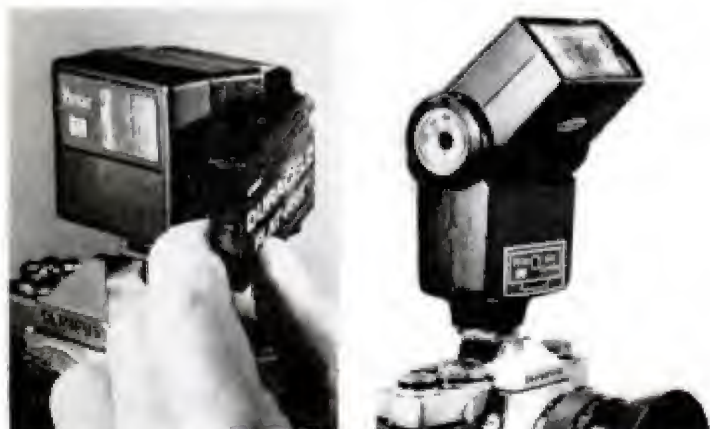
To extend the useful range of electric motorbikes, the Danes have come up with roadside recharging stations designed for commuters. You park at work in the morning, plug your bike into an outlet, and it's fully recharged and ready for the trip home at night. The stations, each able to handle six bikes, are now being tested in Odense, Denmark.



Be the first kid on your block to build your own laser TV transmission set

Here's absolutely the latest word in electronic kits: a helium-neon laser system for transmitting video images. The Metrologic PE-500 kit makes a low-power, helium-neon laser that can be modulated with TV information from a TV camera or videotape machine, and a photodetector that can pick up the laser beams and demodulate it to recreate the original black-and-white TV picture from up to 150 feet away. You can use the system as a burglar alarm, or laser alone for making holograms or demonstrating optical principles. It's \$150 from Metrologic, 143 Harding, Bellmawr, N.J. 08030.

NOW



Flashes of inspiration from Vivitar: Tiny take-along and handy bounce-flash

Vivitar's tiny Model 50 flash is too small and light to ever leave behind, gets up to 200 flashes from the 6-volt Flatpack battery shown (left), has a K25 guide number of 22, costs \$12. But it's nonautomatic and fits hot-shoe cameras only. Vivitar 272 with bounce-tilt head is an automatic flash with a range of 3 f-stops, thyristor circuit for longer battery life, K25 guide number of 50; costs \$90.



Magnetic inserts hold nuts, bolts in sockets

A 6 or 12-point socket set becomes a lot handler with Magnaserts—magnetic inserts that will hold nuts and bolts within the sockets. Made of pliable magnetic plastic, they can be inserted or removed at any time. Set of 10 covers sizes from 7/16 to 1 inch. \$2.98 suggested retail. Automated Industries & Associates, Inc., 2221 Arbor Blvd., Dayton, Ohio 45439.



Wild hybrid: Half car, half motorcycle—and you can even buy one like it for yourself

Hitch a motorcycle front end to an old Corvair rear end and you have a Tri-Vair. California mechanic Leonard Collins wanted the excitement of a motorcycle with the safety of a three-wheeler and thus came up with the unusual hybrid. It does wheelstands (top) and has small extra wheels under the engine (bottom) to keep it from dragging on the ground during lift-offs. The machine has attracted so much attention that Collins is now in business making copies for others. Prices go from \$1900 to \$2600 depending on options. To order yours, write Collins Garage, 301½ West California St., Ontario, Calif.



Instant grandstand rolls in on wheels, folds out for use

Mounted on wheels, these mobile bleachers roll in behind a truck, fold out like an accordion and are ready for use in minutes. Called Porta Bleachers, they're made for temporary use at carnivals, bazaars, parades, civic ceremonies and similar occasions where permanent grandstands would be too costly or impractical. Each 40-foot section seats 260, is about \$4750. Porta Bleachers, 26350 John Rd., Madison Heights, Mich. 48071.

Are you in shape for spring?

New medical research shows a physical checkup plus some simple exercises now can change outdoor sport from an endurance test into healthy fun.

by Jack Galub



Stress test is uphill work as treadmill's angle is increased. Charles Perschetz, of Cardio-Metrics, demonstrates during EKG.



Aerobic ability of blood to feed oxygen to muscles is studied with breathing apparatus during bicycle exercising exam.

"Every weekend, outdoorsmen are in here with wrenched knees, sore backs, sprained ankles," complained the emergency room nurse. "Our cardiac team keeps working overtime. If people would take time to get into shape before they go out, much of what we're doing wouldn't be necessary."

But this year can be different. By starting a training program now, you can be in good enough condition to cut down the chance of becoming another hospital statistic.

Conditioning for the field has three key targets: improved cardiovascular fitness, increased flexibility and agility, and specific muscle strength. Sounds complicated? Some 60 years of fitness medical research show that if you're now in fairly good shape you can start rounding into condition at the end of a month or so. If you've grown fat and flabby over the winter, you may need six to eight weeks.

Stamina—that ability to hike 10 miles or more without feeling completely exhausted—depends on your heart and your respiratory system's ability to supply oxygen to the more than 600 muscles in your body, particularly when you are backpacking up a hill or heading into the wind. Fortunately, the heart is an endurance muscle. The more regularly it is exercised with fast walking, jogging, bicycling or swimming, the better it works under stress. Hearts that aren't adapted to regular exercise peak out too quickly. Like a detuned car engine, they can develop an irregular rhythm. Sometimes they grind to a halt.

The most effective way to check your cardiovascular system today is the stress test. You ride a special stationary bicycle or climb an electrically driven treadmill that can be tilted into an ever-steepening hill. Your heart's reaction is recorded on

electrocardiograph (EKG) tape and monitored by a cardiologist on an oscilloscope. You'll also breathe into an electronic apparatus that determines your body's ability to feed oxygen to your muscles. The stress test may also detect heart problems which could cause sudden death unless treated. These tests are now given in some hospital exercise centers or by such licensed groups as Cardio-Metrics, Inc., New York City, which specialize in the testing and prescription of conditioning programs for cardiacs and noncardiacs alike.

Interval training, a sophisticated walk-jog formula, is usually prescribed to ease an outdoorsman into a conditioning program. Each session is divided into warm-up, stimulus, cool down, with the stimulus making the heart work to build up fitness. Extensive research indicates that 75 to 85 percent of your age-related maximum heart rate (see table) must be reached for a planned length of time for cardiovascular improvement. During your sessions, you

MAXIMUM WORK RATE

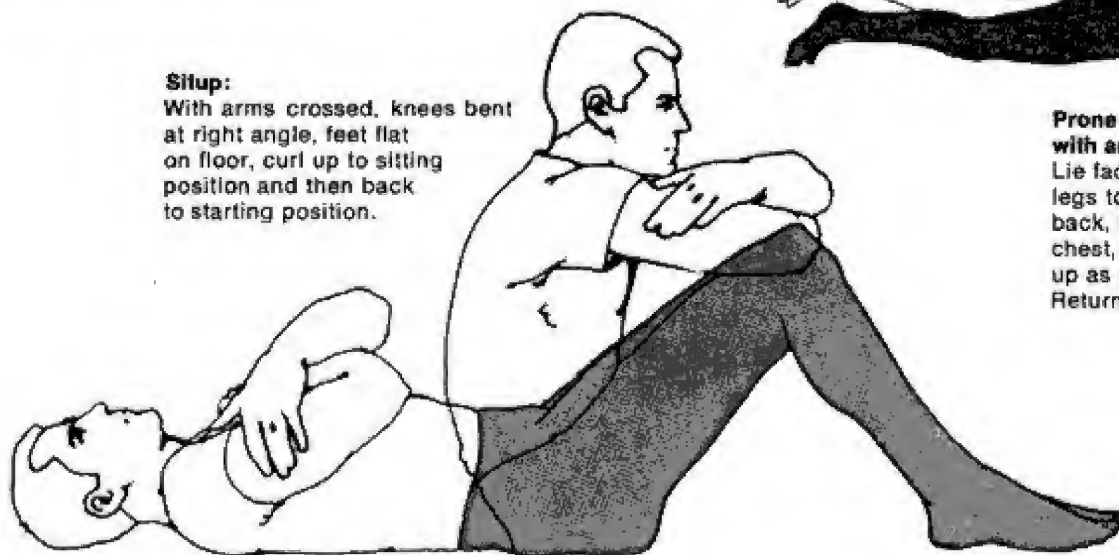
For training to be most effective, a workout pulse rate at 75 to 85 percent of maximum efficient heartbeat is recommended. But moderation is vital: Check with your doctor and ease into training.

| Age | Maximum pulse/heart rate | 85% |
|-----|--------------------------|-----|
| 20 | 200 | 170 |
| 22 | 198 | 168 |
| 24 | 196 | 166 |
| 26 | 194 | 164 |
| 28 | 192 | 163 |
| 30 | 190 | 161 |
| 32 | 189 | 160 |
| 34 | 187 | 158 |
| 36 | 186 | 158 |
| 38 | 184 | 156 |
| 40 | 182 | 154 |
| 45 | 179 | 152 |
| 50 | 175 | 148 |
| 55 | 171 | 145 |

FOR BACKPACKING

Situp:

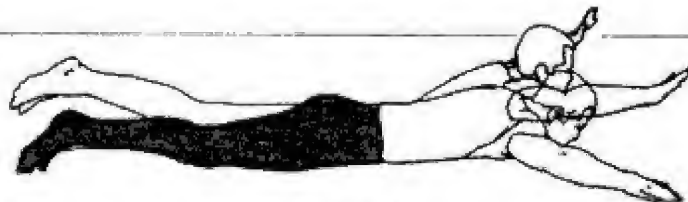
With arms crossed, knees bent at right angle, feet flat on floor, curl up to sitting position and then back to starting position.



Prone arch

with arms extended:

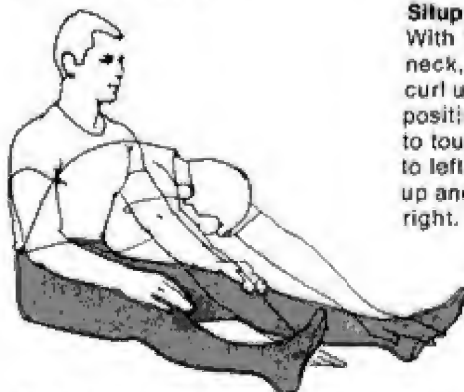
Lie face down with legs together. Arch back, bringing arms, chest, head and legs up as high as possible. Return to start.



FOR CANOEING

Situp:

With fingers laced behind neck, feet one foot apart, curl up to a sitting position and turn left to touch right elbow to left knee. Then up and to the right.

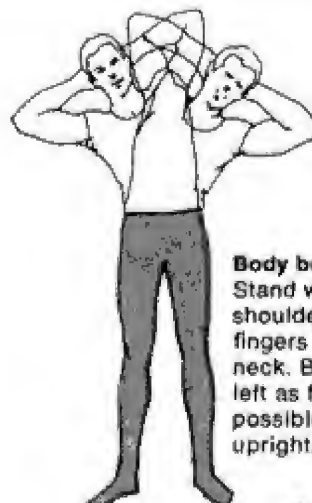


Sitting strength starts with hands on knees. Reach forward as far as possible.



Body bender:

Stand with feet shoulder-width apart, fingers laced behind neck. Bend sideways left as far as possible, back upright, then right.



monitor your pulse regularly for five seconds (and then multiply by 12 for pulse rate) to make sure you are not overworking or underworking your heart.

If there are no testing facilities near you—and an exam by your doctor assures you of a good cardiac profile—you can develop your own shaping-up program. If your profile is poor—a history of heart disease in your family, high blood pressure, overweight, too much smoking—a complete physical checkup and consultation with your doctor is essential before you start.

Begin easily—you're not out for the Olympics or your local ball club. Jogging takes a slow short stride, done from the heels forward rather

than on the balls of the feet. First try jogging 50 paces and walking 50 for 10 or 15 minutes. As your wind builds up, you can walk less. You may find yourself slow-jogging a quarter mile in two weeks, half a mile in a month. With no park or track nearby, you can jog around the block or from room to room at home. Instead of elevators, take the stairs—two at a time.

For the flexibility and agility you'll need while hiking and climbing, practice walking on the outsides of your feet and then the insides with your ankles turned in. These exercises are awkward and difficult at first, but a few minutes every other day will stretch and strengthen muscles, tendons and ligaments.

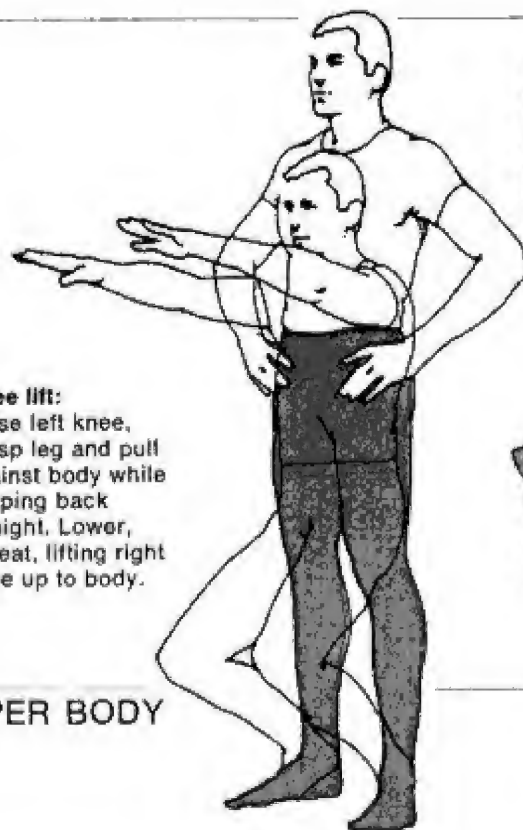
Next, imitate a basketball guard or boxer with feet apart, knees slightly bent. Bob, weave and pivot on the balls of your feet, followed by jumps several inches off the floor. For the lower back and hip joints you will use canoeing and climbing, bend your knees until you can put your palms on the floor. Then try straightening your legs while pulling in your abdominal muscles. Two or three stomach contractions held for five to 10 seconds are enough for each exercise session.

Push-ups should be added to your every-other-day routine. Starting flat on the floor, push up to full arm extension and then lower with body straight until your chest touches the floor. Most people at first aren't able

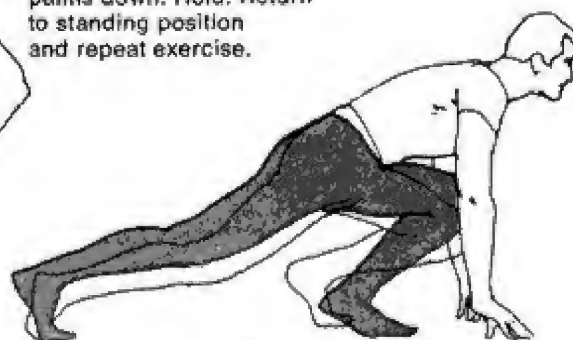
FOR CLIMBING



Knee lift:
Raise left knee, grasp leg and pull against body while keeping back straight. Lower, repeat, lifting right knee up to body.

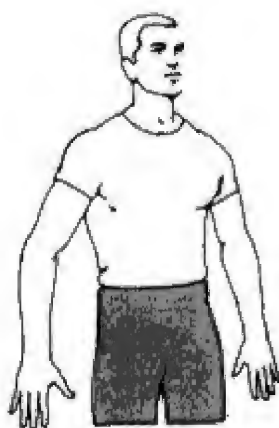


Half knee bend:
Stand erect, hands on hips. Bend knees halfway while extending arms forward, palms down. Hold. Return to standing position and repeat exercise.



Sprinter starts with fingers forward on floor, left leg back. Reverse legs in bouncing movement.

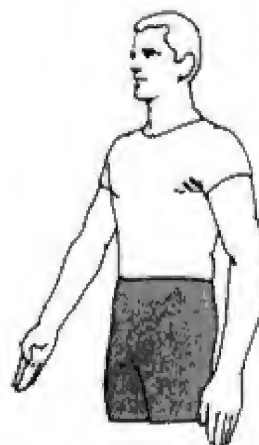
FOR ARMS AND UPPER BODY



Upper body isometrics can start with push back on wall.

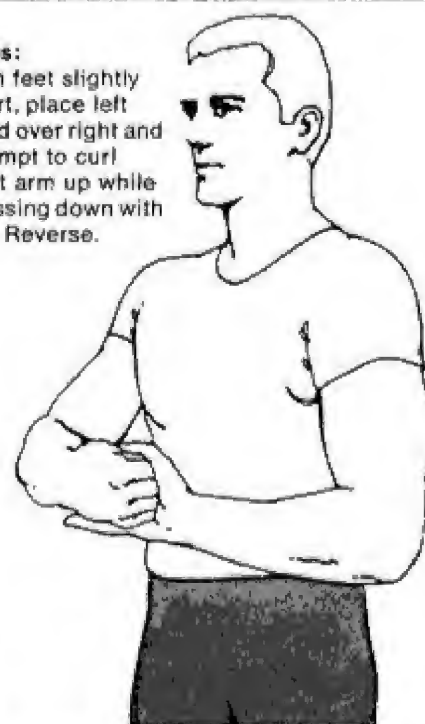


Next face wall and push, again keeping arms straight.



Standing in doorway press outward with backs of hands.

Arms:
With feet slightly apart, place left hand over right and attempt to curl right arm up while pressing down with left. Reverse.



Art: Harry Borgman

to do more than one or two properly without cheating by bending the body.

To develop specific muscle groups, work out with equipment you'll be using and the exercises shown here. If you backpack, wear it weekends on short fast hikes. If you usually carry 20 pounds of gear, double it to 40 for practice. Use your heavy field shoes for early hikes but not for jogging; that requires training shoes. If you want to jog with more load, wrap on ankle weights after you have completed the third or fourth week of workouts.

For canoe training, rig a paddle with weighted rope and pulley mounted on the wall and practice several minutes every day. You'll be

strengthening paddling muscles and toughening your hands, as well, for those long hours on the lake later in the season.

The easiest way to strengthen the upper muscles you'll be using when rock climbing is to actually climb. A school gym, if available, usually has a vertical rope plus the horizontal ladder to swing along. For simple but effective workouts, rig a store-bought chinning bar in a doorway at home and practice doing pull-ups.

The number of pull-ups you can complete should gradually grow as your strength develops.

The isotonic exercises—those in which muscles are actively flexed, compressed and stretched—and the

isometric strength builders—where muscles pull or push against stationary objects or against each other—are both represented in the exercises selected here for outdoorsmen. They should be practiced as shown for best results.

When you're practicing isometrics, breathe naturally. Usually three or four contractions, held for five to 10 seconds, are needed to make the exercises work. Do not hold your breath as that tends to build up internal pressures.

Once you've learned these easy ways to get yourself in shape, go back to them when your outdoor activities taper off next fall. The payoff is in good health and active sport all year long. ★ ★ ★

Drill-driven 'lathe' handles light turnings

by Walter E. Burton

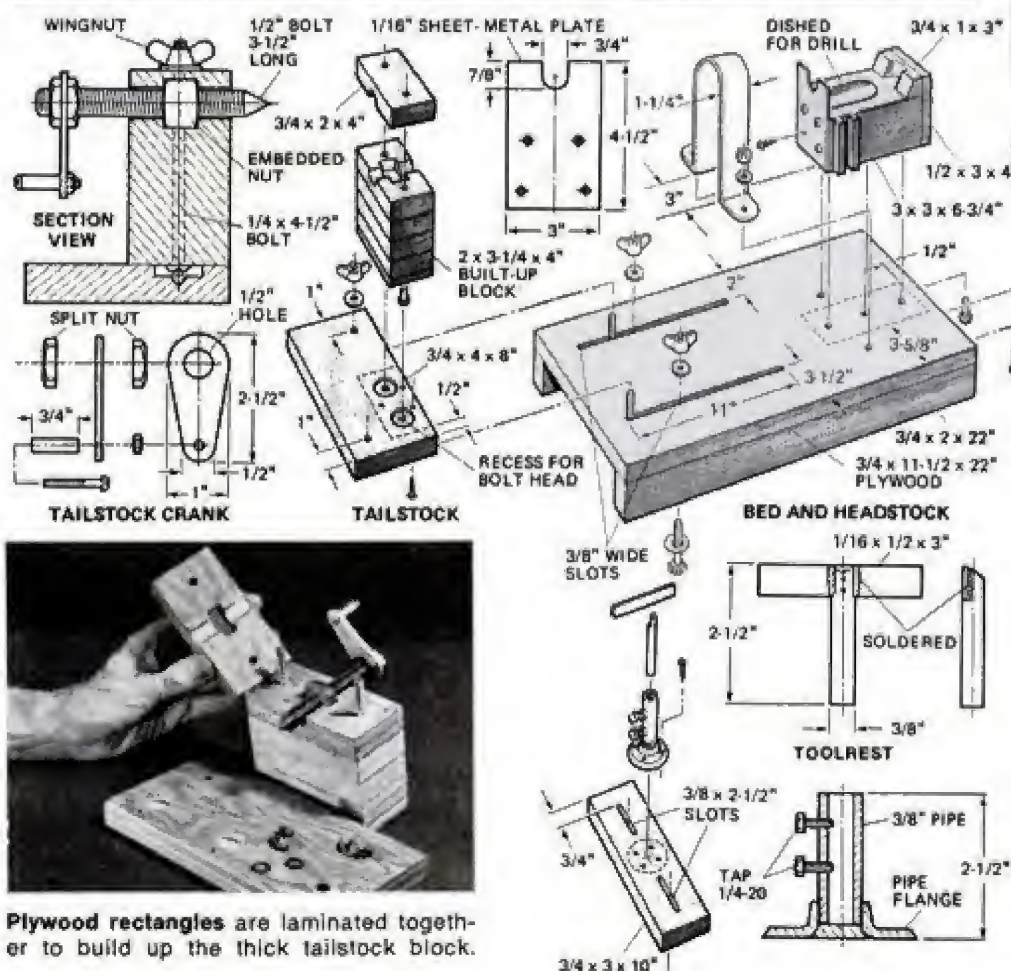
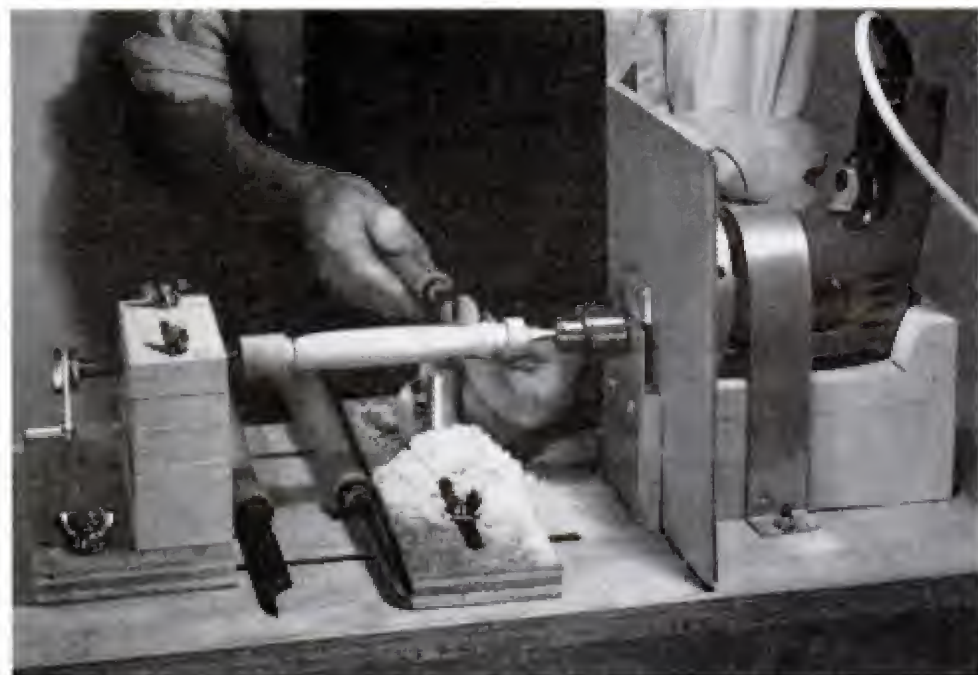
Here's still another use for your portable electric drill—as the powered headstock of a light-duty lathe for filing, drilling, sanding, wire-brushing and polishing.

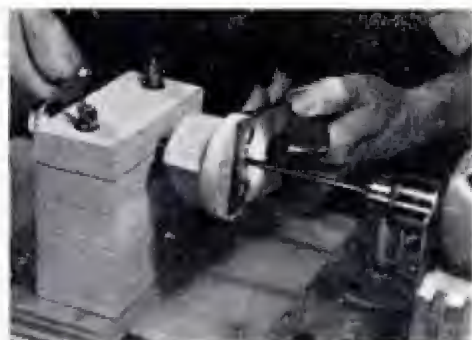
The lathe shown was built to suit Black & Decker's Model No. 7050 variable-speed, reversible drill. It can be locked at any speed in either direction for continuous running. The lathe, designed for turning small wood knobs and tool handles, also can serve to shape soft metal with hand tools.

Cut the bed out of $\frac{3}{4}$ -in. plywood as shown in the drawing below; you can form the two slots in it with a $\frac{3}{8}$ -in. wood bit and keyhole saw. To make the drill stand or platform (shown in the same drawing), you need a $6\frac{3}{4}$ -in. block of 3x3 wood and some $\frac{3}{4}$ -in. wood scraps. Chisel a shallow depression in the top to accommodate a ridge on the inverted drill housing and to permit the flat part of the housing to rest squarely against the wood.

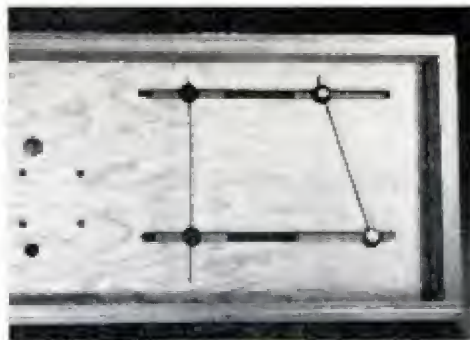
Shape a felt-padded, $\frac{1}{16}$ -in. sheet-metal plate as shown and attach it to one end of the platform with round-head screws. Place a wood block on top of the platform; at the other end, notch it to follow the contour of your drill handle. When this block is altered until there is no end play of the drill housing between block and sheet metal, glue the block in position and back it up with a $\frac{1}{2} \times 3 \times 4$ -in. piece of plywood glued and nailed to the platform. You are now ready to fasten the platform to the lathe bed and install the aluminum "strap" that encircles the drill housing on the two $\frac{1}{4}$ -in. bolts projecting up beside the platform.

The toolrest is similar to a conventional rest system on a wood-turning lathe. Make it as shown on this page and mount it with screws on top of the base. Drill two holes in the side of the toolpost with a No. 7 bit and tap them for $\frac{1}{4}$ -20 setscrews to hold the T in the position desired. Make the T from a $\frac{3}{8}$ -in. headless bolt and a crossbar. Notch the bolt end to receive the bar, then rivet and solder the bar in place.

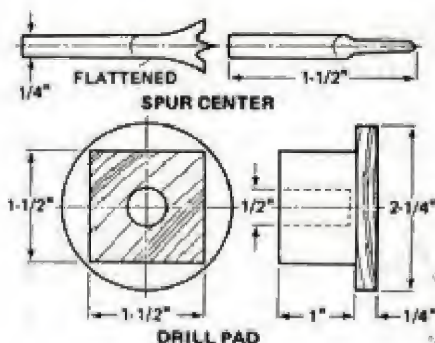




Drill pad supports steel plate against bit while tailstock screw is turned.



Crosswires through bolt heads on underside of base keep the heads from turning.



The tailstock with center consists of a built-up wood block mounted on a plywood base; equipped with a headless bolt pointed 60° at one end and crank at the other (see drawing on facing page). The crank is a simple metal arm clamped between two nuts (made by splitting a standard nut), with a tubular handle.

Clamp toolrest and tailstock bases to the bed with 3/8-16 bolts running through slots in the bed and toolrest base. Make bolt holes in the tailstock base slightly oversize to permit a cross adjustment to align tailstock center with the drill chuck.

To prevent bolts from turning when wingnuts are loosened, drill a diametrical hole through the center of each bolt head to receive sections of coathanger wire. Fit the wires loosely to keep bolts from turning, yet allow them to shift along the slots. Wires should extend about 1/4 in. past each bolt head at maximum bolt separation.

To mount work between centers, make a spur center for the drill chuck from 1/4-in. steel rod. Heat the rod end cherry-red, hammer flat and file notches to form a center point and spurs.

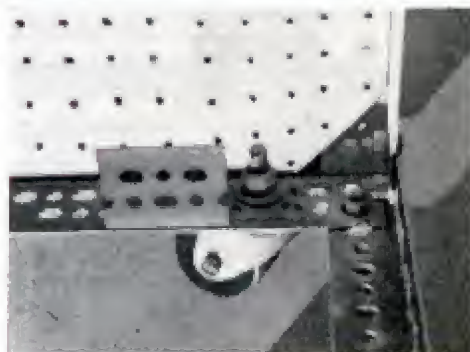
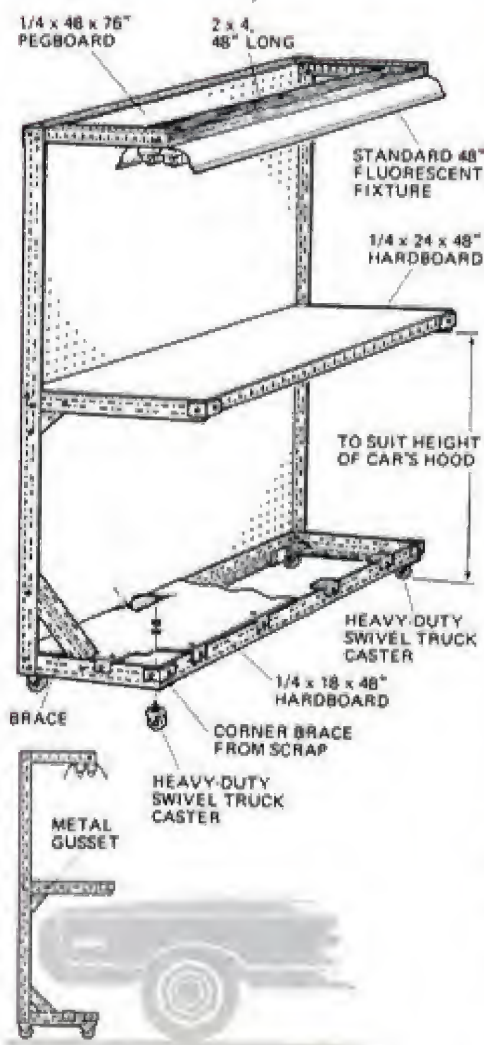
When turning knobs, I found some end play in the drill spindle that could cause the tool to dig into the work. To discourage this, adjust the tailstock spindle until its point presses against the workpiece. No center hole is made—the spindle merely acts as a steadying finger.

To reduce dust sucked into the drill, install a 10-in.-square cardboard baffle on the drill platform (lead photo, facing page). Notch this baffle to slip over the drill and engage grooves formed by 1/4-in.-square wood strips you can nail to sides of the platform. ★ ★ ★

Car tune-up bench keeps tools handy

Any time you can have your tools within arm's reach the job goes twice as fast. It's particularly true when you're tuning your car's engine—the fender just doesn't offer a big enough "counter" for all the automotive tools you'll be using. That's when you'll find this rolling tool panel and bench extra handy, for it can be wheeled right up to where you're working, whether indoors or out. What's more, the bench is designed to take up no more than 5 in. of space when parked at the end of the garage because the car's hood nests neatly under its cantilevered counter.

The bench bolts together like an Erector set when you make it of slotted metal angle. A sheet of 1/4-in. perforated hardboard for a tool panel lets you hang an array of tools both above and below the counter. A standard 48-in.-long two-lamp fluorescent fixture fits perfectly at the top where it is screwed to a 2x4 cross member. The tool counter is bolted to the slotted framework at a height that clears the car hood and is braced, as is the base platform, with pieces of slotted angle. The base platform provides storage for heavy items like a toolbox and spare battery which add stability to the bench.—Pack Bryan



Heavy-duty, ball-bearing casters make it easy to roll tool-panel bench anywhere.

Darkrooms for people

by Elbert Lawton

Need a sink? Brooks Porta Sink (near right) holds three trays (16x20 in \$99 model, 11x14 in \$59 one), rests on table. Richards Tray-Rak (far right) holds three trays, step-fashion; costs \$11 to \$16.

In most homes, finding space for a permanent darkroom is very difficult, but borrowing space for a few hours is easy. When you must borrow space, the trick is not to lose half your time setting up and taking down. Portable darkroom equipment and a work plan are what you need.

The first rule is to keep everything simple. Buy and use only the essentials—"time-saving" luxuries will seem a lot less luxurious if the time saved is then spent in moving them from place to place. Using just the essentials doesn't mean you can't do as good work as the guy with a

permanent setup. However, it does mean that you can't count on quite as many prints per evening without cutting quality.

The second rule is to compartmentalize your work. It simply isn't practical to drag out and set up *everything* each time you have a free hour or two to work.

It's better to break your darkroom work down into separate stages, each served by its own equipment and supplies. I divide my darkroom work into four such stages: chemical mixing; film processing; printing and print processing; and print drying.



Temporary darkroom tactics include the use of a plastic basin (above) to carry each night's equipment to your workroom, using it next as a temperature-control bath as shown and finally using it as a washer; darkening of windows (above right) with plastic lawn bags; use of changing bag (lower right) for loading film-developing tanks.



who don't have darkrooms

spotting and mounting. Limit yourself to one stage per work session (with the possible exception of the mixing stage), and you'll get a lot more done than if you try to do everything at once.

Chemical preparation takes little space and can be done in full room light. You can usually mix your chemicals the night you plan to use them, especially if you go to premixed or liquid chemicals. Many powdered chemicals are supposed to be mixed at temperatures much higher than the standard 68°F. processing temperature. Mix them before dinner, and they'll be down to room temperature by the time you're ready for work.

I prefer one-shot developers that are discarded after use to the kind you replenish. They're fresh each time—important when you do only occasional darkroom work.

Your equipment for this stage should include a quart graduate for measuring and mixing, a two-ounce graduate for adding replenisher (if you use it), a long-stem bar mixing spoon or mixing paddle, a funnel, a thermometer and plastic bottles. Some chemicals, which age more slowly (such as fixer and hypo eliminator), can be mixed more economically and conveniently in gallon quantities—especially fixer, which goes fast. If you do mix a gallon, divide it into quart bottles—the chemicals in the unopened bottles will last even longer, and you'll have less weight to lug around. If you can, use separate graduates and paddles for mixing developer and fixer; otherwise, wash extra-carefully between chemicals to keep one from contaminating the other.

The best place to do your mixing is the kitchen sink. And to carry your chemicals and equipment from storage to the sink and back, use a plastic dishpan—it will come in handy again in the next stage.

Developing film requires just a little additional equipment: a daylight-type developing tank, film reels, a changing bag, scissors, a length of hose (optional) from a bathroom hair-sprayer attachment, and (if you use 35-mm film) either a cassette opener or bottle-cap opener. The

basic chemicals you'll need are film developer, stop bath (optional) and fixer. To speed up your processing, you can use rapid fixer instead of the regular "hypo" type and a hypo neutralizer between fixing and washing to reduce washing time. Dip your film in wetting agent to speed up drying a bit and reduce the formation of water spots.

Use a changing bag as a "darkroom." It's just big enough to hold the film, tank and reels. You can load the tank at your convenience.

When developing, your plastic dishpan can serve double duty as a carry-all to bring your paraphernalia to the kitchen sink and as a water jacket. Filled with water at 68°F., it will bring all the chemicals and the tank to the correct temperature and hold them there.

The best way to wash the film is to use a faucet-attached hose to direct a strong jet of water (still at 68°F.) through the center of the reels down to the bottom of the tank, where it will flush impurities away. Some tanks come with hose assemblies, but the hair-spray hose mentioned earlier will work with many tanks.

Printing takes a bit more equipment: developer and stop-bath tray at least as big as the largest prints you'll make, a larger tray for the fixing bath; tongs to agitate prints and carry them from one tray to another; and another deep plastic basin drilled with holes to serve as a washer.

You'll also need an enlarger and lenses for it. Unless you're sure you'll be shooting just 35-mm or 126 Instamatic photos for the rest of your life, it pays to buy the 35-mm-to-120 size—it won't be much more expensive. Look for one that can be easily disassembled for compact storage, but that is still of quality construction. The quality of your enlarger will directly affect the quality of your prints; this is no place to save money.

You'll need enlarging lenses, too: a 2-inch lens for 35 mm, or a 3-inch for 120 negatives. If you're trying to print both sizes but can only afford one lens at first, use a 3-inch lens, and attach a close-up lens to its front when you need bigger enlargements.

In enlarging easels, your best bet is the kind with calibrated, adjustable masking bands that let you use different paper sizes or crop your borders to precisely match the shape of your image (not all photos look best in precise 8x10 proportions).

Look for one whose masking bands are supported on all four sides, not flopping in the air when you raise them to insert the paper. Begin with an 8x10-size easel; even after making bigger enlargements, you'll find this size easier to use with smaller prints.

The only essential accessory left is a safelight. Enlarging timers, paper safes and focusing magnifiers are useful, but you can do without them at first. Count seconds aloud (say "one-hippopotamus, two-hippopotamus . . .") to space the seconds properly, or watch the kitchen clock's sweep second hand; remove paper sheets one at a time from the box, placing your body as a shield between the open box and the safelight; and check focus with a conventional magnifier.

Once you have all your printing equipment, where and how should you set it up? For the "where," you have several choices: A basement location near the utility sink will minimize disruption of your family's life, provided the location is comfortable and free of dust. The kitchen is the next best bet because of its deep sink and its countertop space—but you'll have to wait till the dishes are washed, and teach everyone to knock before coming in. The bathroom is least preferable, since its sink is too small, its tub too low, and you'll frequently have to stop to admit other family members.

A sink isn't really needed till the final wash, though, so you can set up in a dry room—pick one with lots of space, few windows and low family traffic—just by adding another dishpan full of water to hold the prints till you can take a batch of them outside for washing.

Whatever room you pick, make sure it has a sturdy table or counter that won't shake under your enlarger. Keep your "dry" operations (enlarging and paper storage) separate from your wet ones (developing, stop bath and fixing), either on opposite sides of the room or with a partition between them.

All that's left is darkness—and you need that only for enlarging. For daylight processing, cover the windows with large, black plastic trash bags from the supermarket, the red-

(Please turn to page 166)

Quick care for your electronic ignition system

by Mort Schultz

Electronic ignition has arrived. Chrysler made the system standard, starting with its 1972 models. Ford followed in 1974, and General Motors and American Motors in 1975.

How it works

Although there are variations among different types of systems, all electronic ignition units have eliminated the distributor cam, breaker points and condenser of conventional ignition systems.

A reluctor or timer core, which rotates with the distributor shaft, replaces the cam. It has a "tooth" for each cylinder. A reluctor in the distributor of an eight-cylinder engine, therefore, has eight teeth.

Right next to the reluctor, but not touching it, is a pickup unit which consists of a permanent magnet and a coil wound around a pole. As a tooth of the reluctor passes the pickup unit, magnetism increases, which induces a positive voltage at one of the coil terminals.

This voltage triggers the circuitry in the electronic control unit, causing a break in the ignition coil's primary circuit. What happens then is the same as what happens in a conventional ignition system when distributor points open: The magnetic field in the ignition coil collapses, inducing high-tension current in the secondary circuit. Current is transmitted to the individual sparkplug through the rotor, distributor cap and sparkplug cable.

Advantages of EI

Here are some of the advantages of electronic ignition systems:

- Since there are no breaker points, there are no point problems to hinder engine operation, such as point erosion.
- Dwell angle is no longer a factor. Dwell angle is the distance in degrees that the cam of a conventional distributor rotates when points are

closed. It goes out of adjustment, because the cam and point block rub against one another and wear down. But no parts of an electronic ignition distributor rub against one another.

■ Since dwell angle affects ignition timing, checking timing as often as you've been doing becomes unnecessary. In fact, the whole concept of ignition system tune-up is radically changed. Tune-ups are simpler and don't have to be done as often.

Tuning electronic ignition need not be done any more often than you need to clean or change sparkplugs.

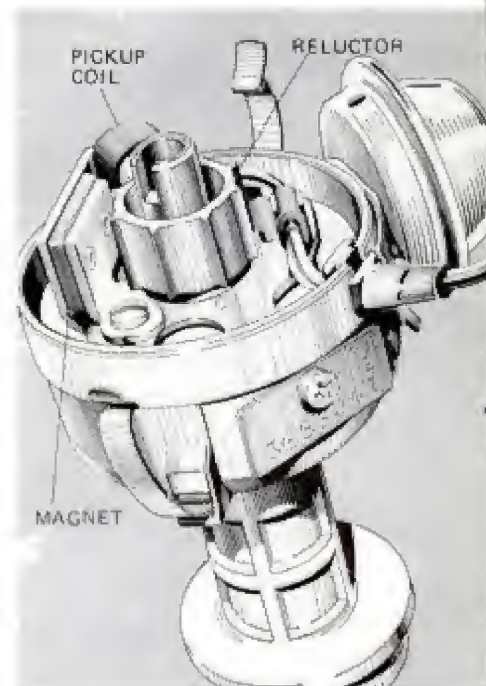
AMC and Chrysler claim that the plugs in their cars can last as long as 30,000 miles; GM says 22,500 miles; and Ford, 20,000 miles.

It's not service-free

Too many people may get the idea that an electronic ignition system requires no service and can never fail, neither of which is true.

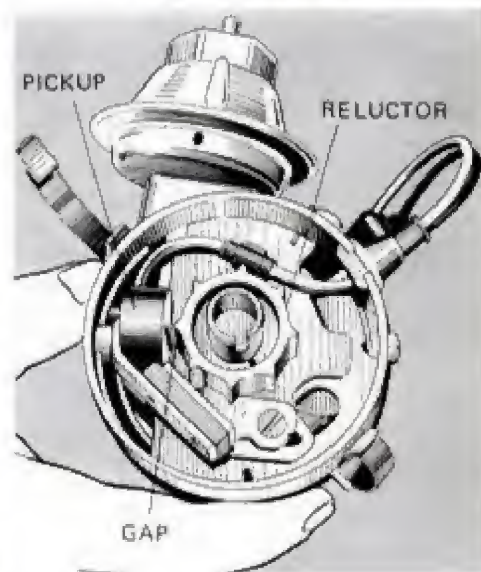
What you have to do every 20,000 to 30,000 miles, depending on the manufacturer's recommendation, is so easy that you can practically do it in your sleep. But it must be done. Otherwise the engine will fail to start or will start running rough. Make these checks:

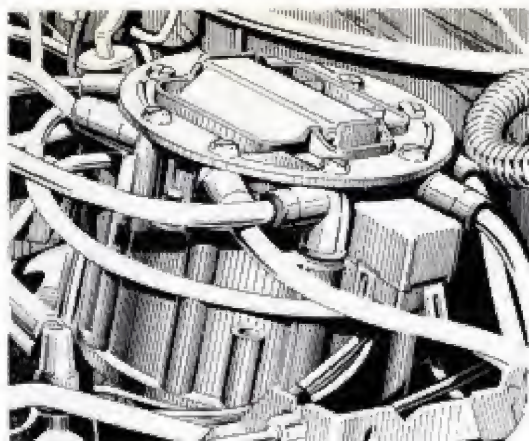
- As mentioned, replace sparkplugs, but also remove the distributor cap and inspect the rotor for cracks and burned areas on the metal strip. Replace the rotor if it's damaged.
- Inspect the distributor cap by wiping it clean with a dry rag. Look for cracks, corroded terminals and carbon tracks. Replace a damaged cap.
- Replace high-tension wires if insulation is brittle or frayed, but the preferred way of checking wires is to test them for excessive resistance with an ohmmeter.
- If wires exceed the resistance values shown in the table on the facing page they should be replaced (replace



Distributor used with typical electronic ignition system looks like conventional unit. The difference is inside: Reluctor and pickup coil are the make-and-break components. They do the job of the cam and breaker points in a conventional ignition system.

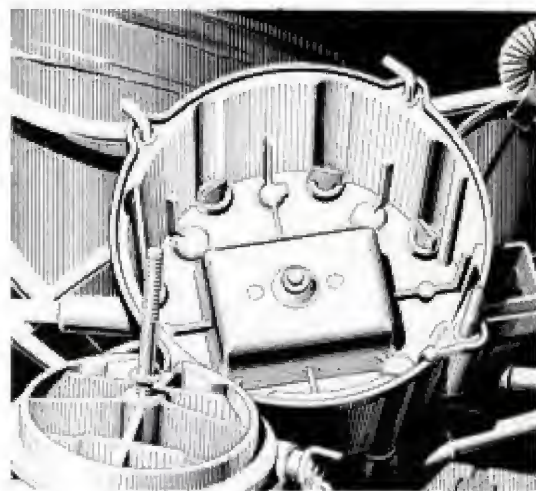
Point gap in a conventional system has its equivalent in an electronic ignition system in the gap between pickup and reluctor. The reluctor teeth pass very close to the pickup but they never touch it.



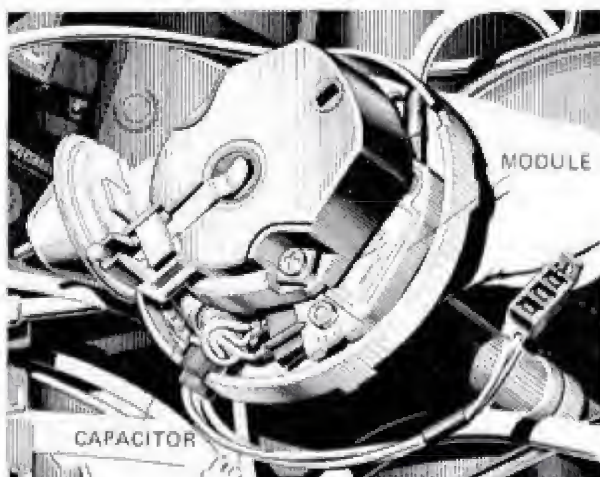


1975 General Motors cars use the distributor shown here in their electronic ignition systems. It's much larger than other makers' because it houses more components.

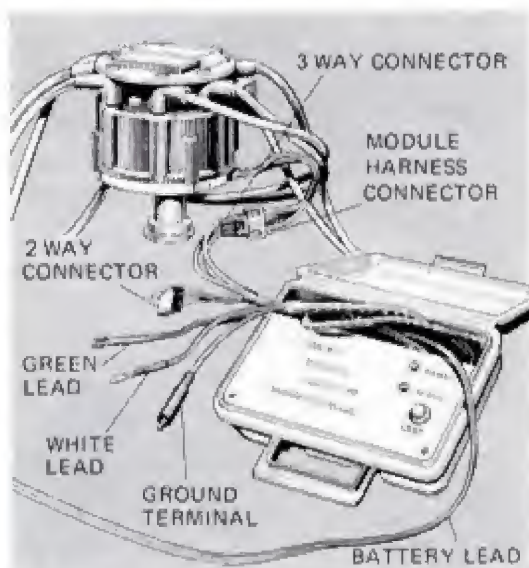
Inside distributor cap of the GM electronic ignition system (called HEI, for high-energy ignition) is the rectangular-shaped ignition coil. Not molded into the cap, it can be removed and replaced separately if necessary.



The large rotor takes up most of the space inside distributor body of the GM HEI system. Also inside is the module or electronic control unit and a capacitor. It is not part of the ignition operating circuitry, but functions as a noise suppressor for the radio.



| Length of wire (in inches) | Maximum resistance (in ohms) |
|-------------------------------|---------------------------------|
| up to 15 | 10,000 |
| 15-25 | 15,000 |
| 25-35 | 20,000 |
| over 35 | 25,000 |



Special test instrument built by General Motors for use with HEI system checks on all functions. It connects to module harness and gives go/no-go readings. See text for further discussion of test instruments.

wires as a set—if one shows excessive resistance, replace them all).

■ Finally, check ignition timing—the same way as you've been doing it for conventional ignition.

Suppose an engine with electronic ignition becomes hard-starting or begins running rough at all speeds. (If it runs rough only at idle, the ignition is not at fault. The problem may be located in the ignition system, which should be tested.

Special test equipment

Troubleshooting electronic ignition is as easy as troubleshooting conventional ignition, especially the GM and Chrysler systems, with a special tester giving read-outs on a test panel to show a "go" or "no-go" condition.

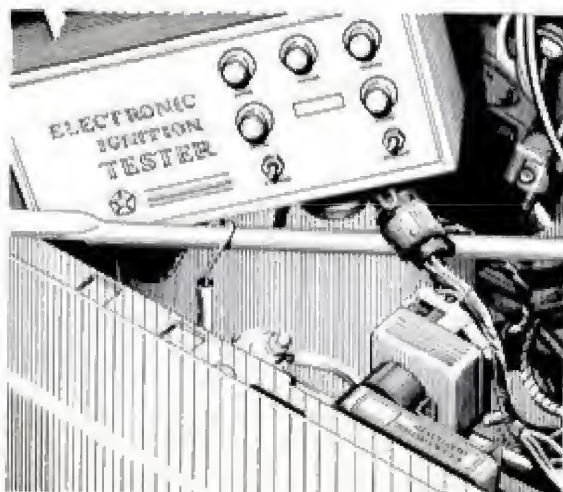
The GM electronic ignition system, called High Energy Ignition (HEI), is uniquely different from Chrysler's, Ford's and AMC's. All components, including the ignition coil and electronic control module, are built right in the distributor.

Testing HEI the easy, modern way requires the HEI tester (J-24642) which the maker, Kent-Moore, says will be sold directly to the public.

When this was written, the HEI tester cost \$65, plus shipping. If you're interested, write Kent-Moore Tool Div., 1501 South Jackson St., Jackson, Mich. 49203.

The special tester used to trouble-

In the Chrysler system, the electronic ignition tester plugs into the electronic control unit. It tests the primary circuit, auxiliary ballast resistor circuit, pickup circuit, ignition input voltage, control unit, ignition coil.

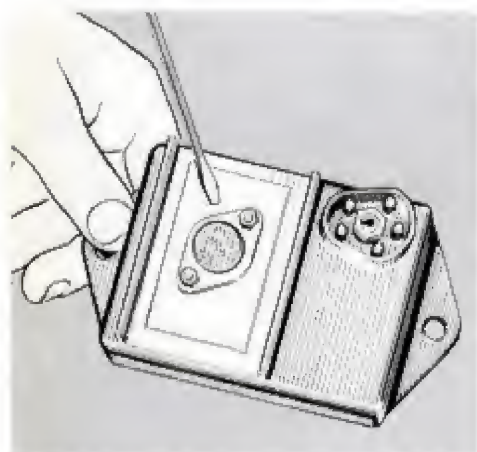


shoot the Chrysler electronic ignition system (C-4166-A) costs \$75.50, plus shipping. It can be ordered from Miller Special Tools, 32615 Park Lane, Garden City, Mich. 48135.

Testing with these meters is quite simple. Generally, you hook the tester into the control-unit wiring harness and make most tests in this one position.

Using simple meters

However, you do not need a special tester. If you have a sensitive dc



Switching transistor in the Chrysler electronic ignition system is mounted on the control unit. Don't touch it when the ignition is on—you'll get a jolt.

voltmeter and ohmmeter, you can test any electronic ignition system. Ford and AMC units make no provision as yet for special testers—just an ohmmeter and voltmeter.

Each of the four systems—GM's, Chrysler's, Ford's and AMC's—is tested in a different way, and we don't have the space to discuss each here. However, special testers come with complete instructions. If you use a voltmeter/ohmmeter, you must have a service manual for your car, which outlines the procedure.

Do not try troubleshooting an electronic ignition system without instructions. There are many pitfalls, and a wrong connection can result in a burned-out system.

In servicing the various systems, I found there are several obstacles to avoid that aren't necessarily mentioned in instructions. You should be aware of the following if you decide to service your car's electronic ignition system:

Service tips:

1. You can get an overall indication of electronic-ignition functioning in every system except GM's by disconnecting the high-tension wire from the center tower of the distributor and holding its end about 1/4 inch from a ground. Crank the

engine. A fat blue spark arcing the gap between the wire and ground indicates a solidly performing system. Use insulated pliers to grasp the wire. The bare-handed method may give you a stiff jolt.

Caution: With a conventional ignition system you can pull a sparkplug wire from a plug when making this kind of spark-intensity test. But don't do it with electronic ignition. Depending upon the system, if you hold the wrong wire to ground it can result in damage because of internal arcing in the distributor.

2. Be careful around the switching transistor: It receives pulses from the pickup coil. It's "hot" and can set you on your tail if you touch it when the ignition is on.

3. When you remove the distributor of the HEI system, you'll see what looks like a condenser, but don't think they made a mistake at the factory and equipped your unit with a conventional ignition-system part. It's a capacitor which is not a component of the ignition system. It functions as a noise suppressor for the radio.

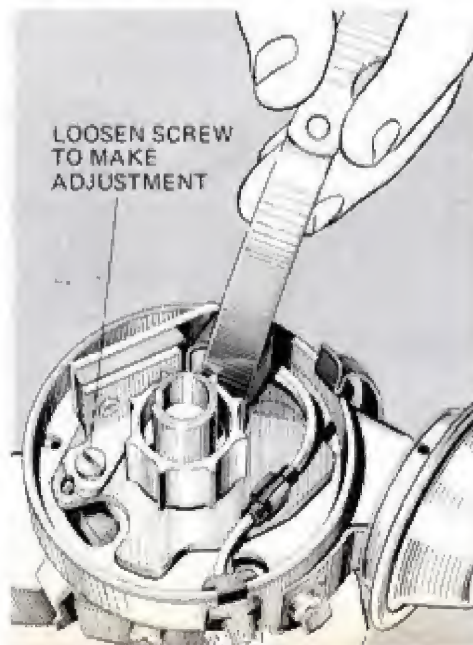
4. If the engine is hard-starting after a pickup unit has been replaced, suspect that the air gap between the reluctor and pickup coil was not set properly. The gap must not be set with a magnetic feeler gauge. An erroneous setting will be obtained because of the constant magnetic field surrounding the coil. Use a non-magnetic feeler, preferably one made of plastic.

5. Be careful around the pickup coil. Its wires are very delicate and can easily split.

6. A hairline crack in the pickup

(Please turn to page 150)

Setting gap between the reluctor and the pickup should be done precisely, following specs for car. Do not use magnetic (metal) feeler gauge; use plastic one.



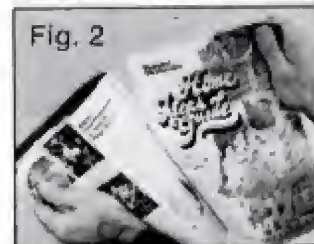
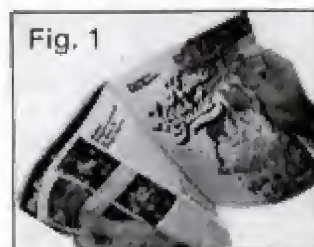
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Build a deck— it's the low-cost way to get more room

by Harry Wicks
WORKSHOP EDITOR

Firmly entrenched as part of the American lifestyle, outdoor living can be as pleasant as you want to make it. Whether you attach a deck to your home to serve as a transition area from house to nature, to function as a sun trap, or to be an extension of indoor living, it is unquestionably the least expensive way to add more living space to what you already have.

In the past two decades patios and terraces have evolved from little more than drab slabs of concrete to the sophisticated-looking structure shown on these pages. Of multilevel design, it has many features you may want to adopt, whether your site is hilly or flat.

We've zeroed-in on three outstanding features: steps, planters and railing. How they're put together is shown on the following pages.



As if to prove the point that do-it-yourself construction isn't always as difficult as it may seem, the deck shown above—which is attached to a house parked on a hilly site in San Anselmo, Calif.—was built entirely by John Braun, age 18. An accomplished (and locally celebrated) ceramic potter, John noted that the project was a challenge "worth the effort considering the use that the family now gets from this outdoor room."

Ideal place for redwood

A multilevel deck makes sense because it reduces the amount of furniture you will need when entertaining a crowd—you simply scatter pillows and use the steps.

There are some basics you should be familiar with before taking on a deck project. For example, to get good appearance and high resistance to attack by insects and decay, you should consider using redwood throughout. And you can select from the lower-cost redwoods: Construction Heart is generally used for construction in or near the ground; Construction Common for decking and other off-the-ground members.

Fasteners

Make certain you use either stainless steel, aluminum alloy or hot-dipped galvanized nails and fasteners. These won't rust and cause ugly stains on the wood.

Finishes

Redwood gives freedom of choice



Big advantage gained with multilevel deck is that the need for a great deal of patio furniture is eliminated—you simply use the steps for extra seating. Handsome deck shown has levels requiring three steps (photo above) and two steps (below). How they were built is shown on facing page; redwood was used throughout.



Back view of architectural railing surrounding deck (right). Alternate posts are fashioned using three lengths of 2x6-in. material per post; posts in between are doubled-up. Since good deck construction calls for use of noncorrosive nails and fasteners, hefty galvanized bolts were used to secure railing to deck.

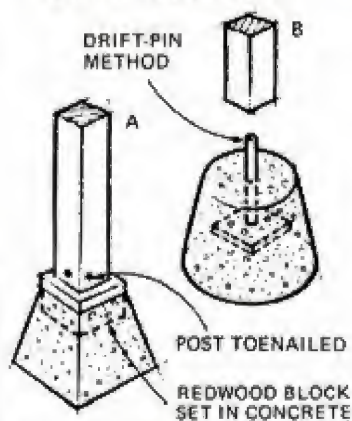


Front view of sturdy railing is what you see from deck (left). Redwood planks which sandwich the rails are held together with bolts, washers and nuts. Notice that no attempt was made to conceal the boltheads; by choice, the fastening hardware has been left exposed to serve as an interesting architectural detail.

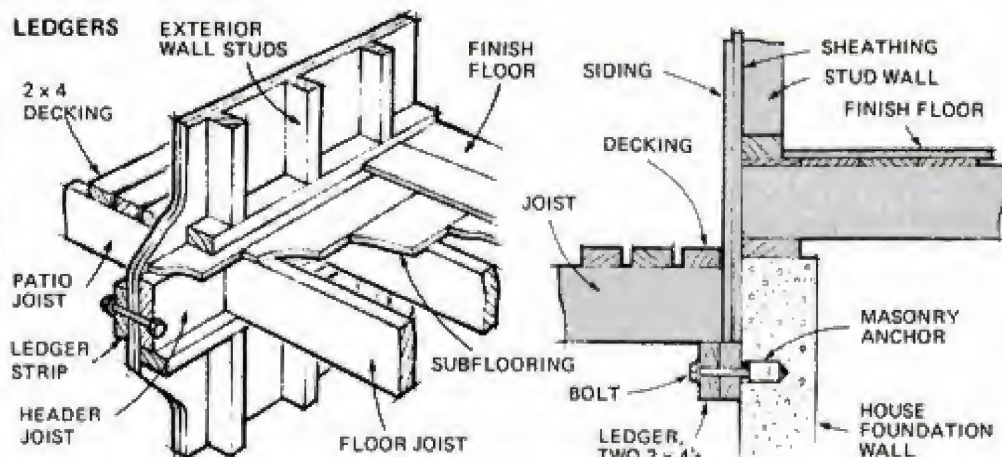


Simple, yet elegant, planters (above) are strategically located to divide levels. These are well-stocked with plants to provide lots of color and create mood-setting decor. Plants are not permanently installed in planters. Instead, potted plants sit upon 2x2 rails. This way, rainwater passes through instead of collecting.

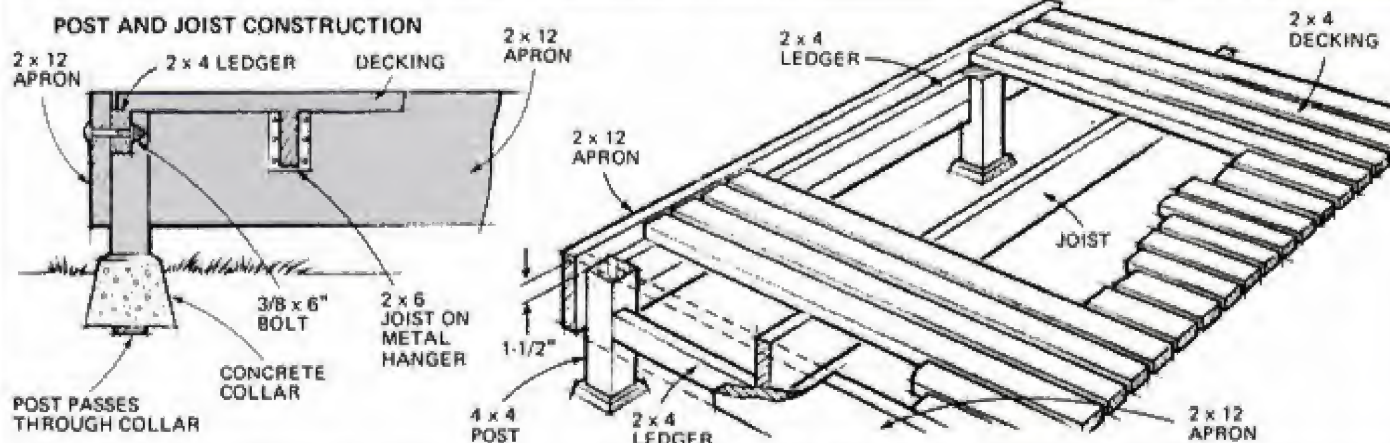
POST ATTACHMENTS



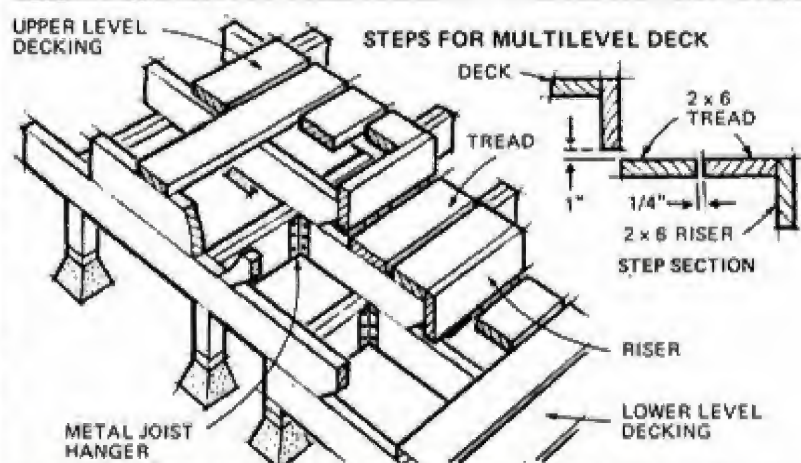
LEDGERS



POST AND JOIST CONSTRUCTION

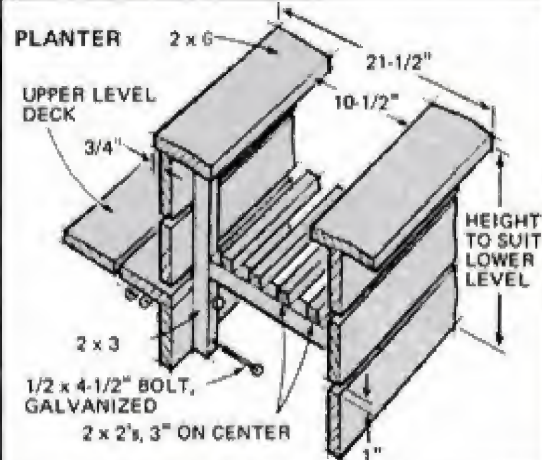


UPPER LEVEL DECKING

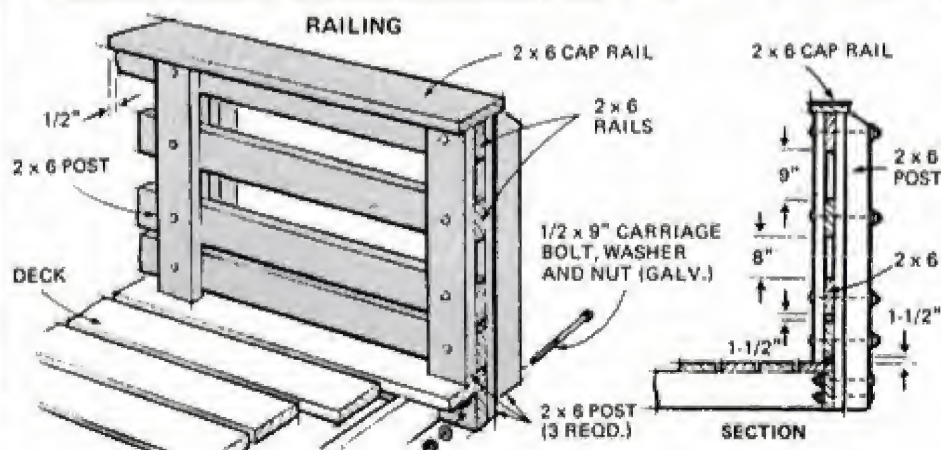


STEPS FOR MULTILEVEL DECK

PLANTER



RAILING



when you're picking a finish. Here's a quick rundown:

■ A clear water-repellent finish is highly recommended. Easy to apply, it stabilizes wood color, retards weathering and reduces moisture effects.

■ Bleach can be used to hasten a driftwood-gray effect similar to natural weathering.

■ Pigmented stains won't completely hide the grain and they look more natural than paint.

■ Varnishes aren't recommended; they deteriorate rapidly in outdoor use.



PM's stowaway for patio dining

Designed exclusively for PM, this unique table folds up for quick and easy storage.

by Wayne C. Leckey HOME AND SHOP EDITOR

It's great to have a big table out on your deck or patio for those pleasant summer-evening meals. But finding a place to store it is something else. Often it simply stays outdoors all year.

We tossed the storage problem at designer Tom Fung, well known for his unique designs, who came up with the ingenious folding table you see here. Eighteen pivot points make it possible to fold the table into an incredibly small space of 2x5 feet, which means you can park it in a garage or basement with room to spare.

We built the prototype, from long-lasting redwood for a material cost of about \$75. If you use No. 2 pine and paint it, it can be made for less. While it may look difficult, it's actually an

(Please turn to page 118)

PAINT ISN'T ALL IT'S CRACKED UP TO BE.

Consider these guaranteed alternatives...

If the exterior of your home is old paint, old stain, or unfinished new wood, we're talking right to you. Odds are you want the finish you put on to do two things: Look beautiful and stay that way. That's why, before you settle for house paint, we'd like you to think about these four guaranteed ways to do the job better.

Put on the Overcoat:

If you've got old paint, why add another layer to the problem? Instead of repainting, put on new Olympic Overcoat. Overcoat is a truly revolutionary new acrylic coating—like some paints—but so superior we refuse to even call it paint. Overcoat goes on easier than anything you've ever used. It covers almost any surface in a single coat and dries quickly to a beautiful flat finish that lasts and lasts.



It's guaranteed better than house paint!

You'll be amazed at the way Overcoat performs. Try it. If you're not convinced that Overcoat is better than house paint, return the remainder of your first gallon and any unopened cans, with receipt, to your dealer, and he'll refund your money.

For the mellow look.

To dress your home in mellow, rich color—use Olympic Solid Color Stain. Rich in pigment, Olympic Solid Color Stain covers beautifully without forming a thick film. Instead it penetrates the wood—lets it breathe—for lasting protection. We guarantee your money back (or provide replacement gallons at our option) if Olympic Stain ever cracks, peels or blisters.



Stain over old paint?

That's right. Thousands of homeowners have done it successfully—just as long as the surface is rough wood siding, shingles or shakes. A single coat is usually all it takes to achieve the mellow beauty you can only get with solid color stain.

Plus water clean-up.

If you'd like the stain effect and guarantee—plus water cleanup—your answer is new Olympic Acrylic Latex Solid Color Stain in the blue can.

For the ultimate beauty of wood.



Olympic Semi-Transparent Stain does the most beautiful thing you can do for new wood: It highlights the natural grain and texture, enhancing wood's appearance with soft color that weathers graciously. Rough or smooth siding, decks, fences, outdoor furniture—you name it—

if it's wood, nothing adds subtle beauty and lasting protection like Olympic Semi-Transparent Stain. It too is backed by the Olympic Stain guarantee.

Ask a pro.

For straight answers to any questions you have about finishing your home, see your Olympic dealer. Look for them in the Yellow Pages.

Olympic Stain. A division of COMERCO, INC.,
Dept. C, 1148 N.W. Leary Way, Seattle, WA 98107.

Olympic Overcoat or Olympic Stain.
Guaranteed satisfaction you won't get with paint.



PM's FOLD-UP PATIO TABLE

(Continued from page 116)

easy table to build, mainly because all the parts are of lumberyard size which you just cut to length.

The table is identical each side of a centerline. Each bench is alike, as is each scissor-folding leg. Spotting the seven pivot holes for each leg is done best by marking their locations on a sheet of plywood or wrapping paper and drilling the holes in the leg members to correspond. Round the ends of the members to a 1 3/4-in. radius and drill holes at the compass points. A good stunt to follow when rounding the ends and drilling the holes is to do two or more ends at one time by clamping the members together. This assures perfect alignment of the holes and makes for a neater job.

Cut parts C, to which the six table-

top members are attached, from 1 1/8-in.-thick stock and join them endwise with 5-in. strap hinges. Drill an additional hole in each hinge leaf for a second carriage bolt. Use wood turnbuttons to lock the tabletop in the open position; place them on the underside near the hinges, on opposite sides of the centerline. You can keep the bench legs from being kicked outward accidentally by use of king-size hooks and eyes, and draw up the carriage bolts holding the legs snugly so the legs do not swing freely. Place three large washers between leg members at each point where the benches attach, elsewhere, just one washer. Place washers under all nuts, of course.

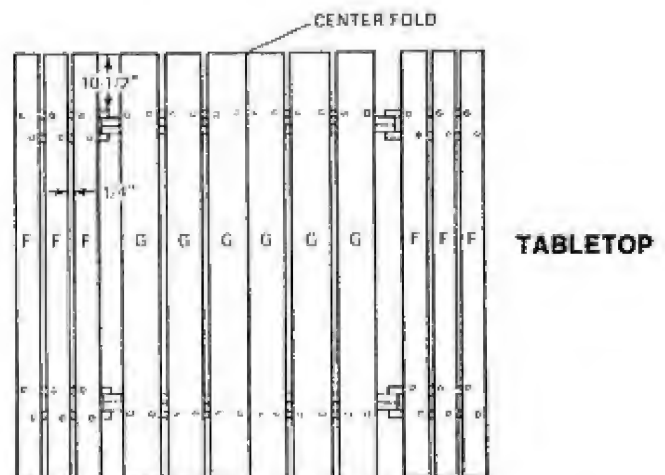
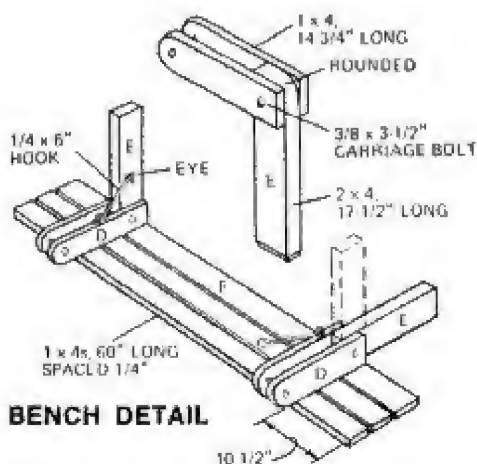
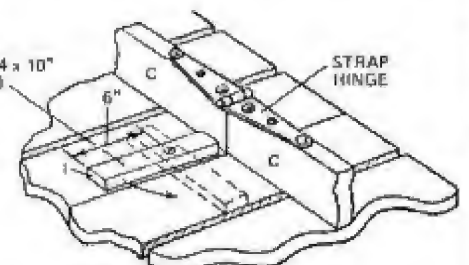
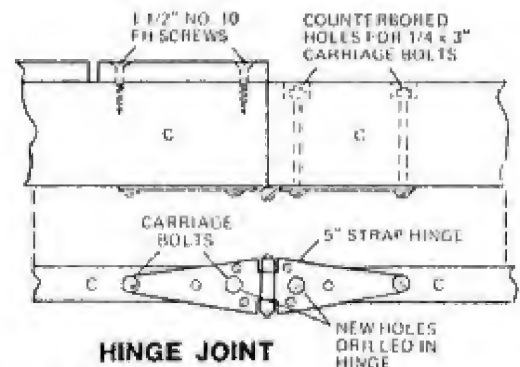
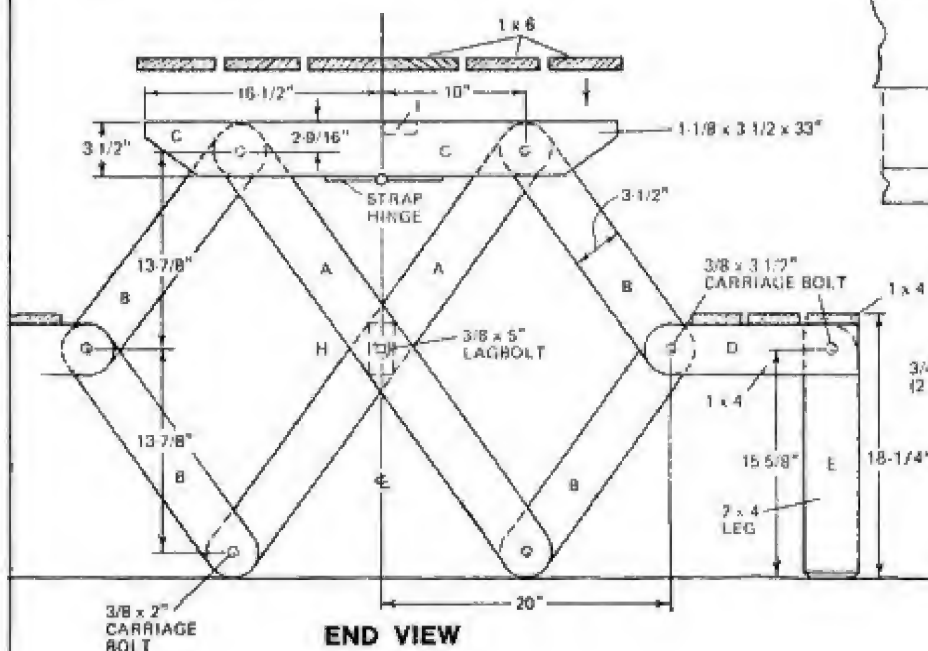
Brass flathead screws are best for fastening the seat and top boards since they won't rust; cadmium-plated are second best. You have a choice of leaving the screwheads

exposed or driving them in counter-bored holes and capping them with wood-screw plugs. Space all boards 1/4-in. apart except at the center. Your completed table can be finished with redwood stain or left as is to weather naturally. ★ ★ ★

MATERIALS NEEDED (Redwood)

| Key | Size | Amt. |
|-----------------|------------------------------|------|
| A | 3/4 x 3 1/2 x 38" | 4 |
| B | 3/4 x 3 1/2 x 20 3/4" | 8 |
| C | 1 1/8 x 3 1/2 x 16 1/2" | 4 |
| D | 3/4 x 3 1/2 x 14 3/4" | 8 |
| E | 1 1/2 x 3 1/2 x 17 1/2" | 4 |
| F | 3/4 x 3 1/2 x 60" | 6 |
| G | 3/4 x 5 1/2 x 60" | 6 |
| H | 1 1/2 x 3 1/2 x 34 3/4" | 1 |
| I | 3/4 x 1 3/4 x 10" | 2 |
| Hardware | | |
| | 1/4 x 3" carriage bolts | 8 |
| | 3/4 x 3 1/2" carriage bolts | 4 |
| | 3/4 x 2" carriage bolts | 4 |
| | 1 1/4" No. 10 FH wood screws | 2 |
| | 1 1/2" No. 10 FH wood screws | 48 |
| | 1/4 x 6" hooks and eyes | 4 |
| | 5" strap hinges | 2 |
| | Cadmium-plated washers | 34 |

Construction details



IT DRILLS IN WOOD, METAL,
PLASTIC. DRIVES SCREWS
IN, AND REVERSES TO TAKE
THEM OUT. CHISELS WOOD
TO MORTISE A DOOR. LIFTS
OLD TILE FROM THE FLOOR.
IT BORES IN CONCRETE OR
BRICK OR ROCK.



SKIL
XTRA-TOOL

Growing gracefully



Two lush indoor gardens—a living wall that blends with colonial decor and a contemporary plant stand. Plans for building both are on page 122; you can build either in a single weekend.



An individual potted plant adds an attractive touch to a room. But when you group several plants in an indoor garden, you'll create a luxuriant display of foliage that hints of spring—even when snowdrifts are piled outside the window.

The arrangements shown are both practical and good-looking. They're designed to simplify daily plant care, and construction (detailed on the following page) has been kept simple. In addition, the structures protect the floor beneath the plants.

Place your indoor garden so plants get best exposure to light. If artificial light is needed, you can use a type specially designed for horticultural purposes. (Vita-Lite by Duro-Test Corp., North Bergen, N.J., is such a "light"; it emits the full spectrum of natural light plus the beneficial ultraviolet spectrum.)

(Please turn to page 122)

One of the most important tools you'll ever buy.



Why? Because MASTER SHOP GUIDE lays out everything you need to know, graphically and ready-to-use.

What? All about nails, screws, bolts, wall fasteners, drills, abrasives, lumber, plywood, gypsum, adhesives, paneling, shop math, stair construction, masonry, wood finishing, plumbing, pipe fittings, electrical work, gutters, concrete, remodeling measurements *plus* a built-in ruler, protractor, 45° tri-

angle and compass. *You'll use it in every job you tackle.*

How? Twelve hang-up, stand up boards. 24 surfaces of laminated-to-last wipe-clean plastic. 56 charts. *The fundamental workshop reference tool.*

Who? Chances are, your "shop-wise" neighbor already has one. Nearly two hundred thousand sets have already been purchased by Popular Mechanics readers and shop enthusiasts.

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Address _____

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HM Specialties _____

GROWING GRACEFULLY

(Continued from page 120)

Living wall

Constructed of $\frac{3}{4}$ -in. plywood with a 2x4 grid, this garden requires no elaborate joinery—all pieces are simply butt-joined.

Start by measuring the wall area and if necessary, adjust drawing dimensions. The unit's height is critical so make certain you measure carefully. The top can be flush with, or just a shade lower than, the window stool. If you build a taller unit, make certain you will be able to operate windows.

Assemble the wall unit using waterproof glue and screws. The wall unit is freestanding—unless the floor it rests on is badly out-of-level. If so, shim the unit plumb with wood shingles and use several screws through the unit's back into the wall

studs. The floor grid is of 2x4 stock. Each well is fitted with a sheet-metal box; joints are soldered to protect the floor below.

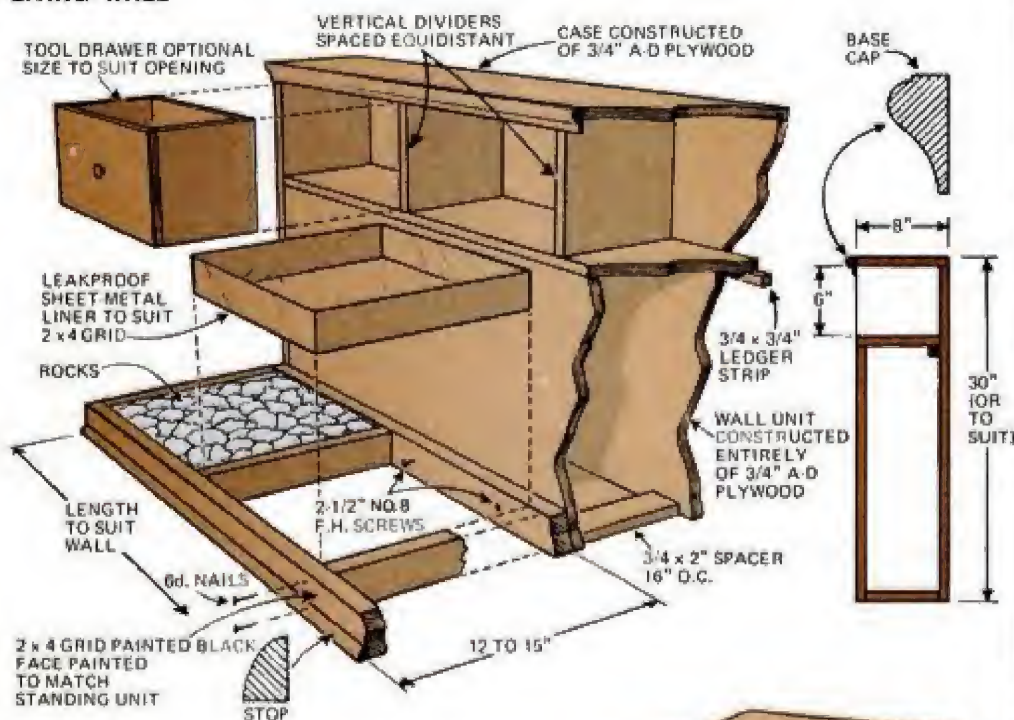
To finish, apply a coat of primer, allow to dry and paint with colors to suit. For looks, paint the grid interior black and use wall color on the face to coordinate with the wall unit.

Contemporary plant stand

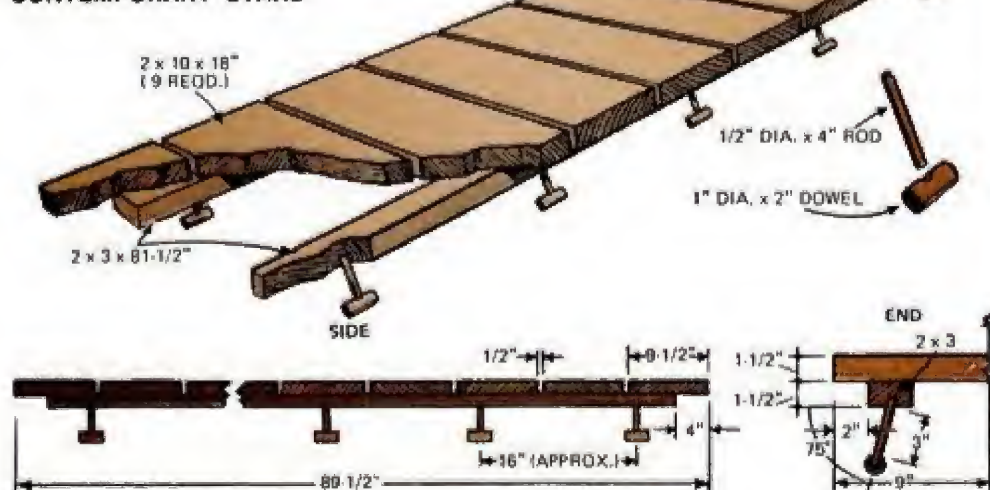
Simplicity is the word here. The unit consists of short lengths of 2x10 redwood fastened to a pair of 2x3s. The trickiest part is maintaining the angle for the holes which receive the dowel legs. If you lack know-how for setting up a drilling jig, simply make the legs perfectly vertical.

Finish the stand using clear waterproof sealer on the redwood. ★★

LIVING WALL



CONTEMPORARY STAND

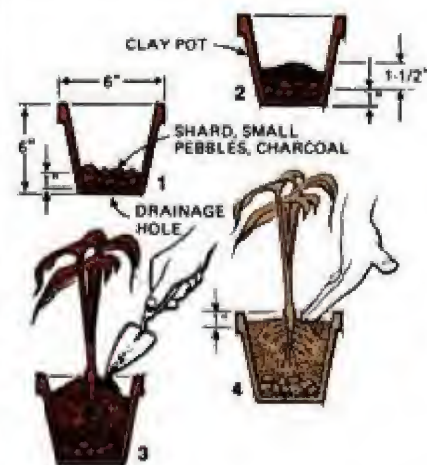


Tips for starting an indoor garden

Which plants to grow is basically a question of light source. Actually, you can grow practically any plant indoors, from roses and foliage to lush tropical varieties and cactus. It all depends on the quality of light. Do you have direct sunlight all day? Or is it partial or filtered sunlight? Or northern light? Or artificial light? Once you know the location of your indoor garden, you can select your plants using any good plant book giving a full list of light and temperature requirements.

Pots. Most indoor gardeners prefer clay pots, but you may want to pick up several ceramic jardinières for use as color and shape accents in your planting setup.

It's a good idea to buy correct-size clay saucers to go with the pots. Pick those that have a protective coating to prevent water from seeping through to plant stand or furniture.



Potting a plant. Use only a clean container to pot a plant. And a new clay pot should be soaked overnight in water to minimize the amount of moisture it will draw from planting. The sketch illustrates the four basic steps of potting: 1. Fit a piece of shard (broken pot) over the drainage hole then add some porous stones. Toss in some pieces of charcoal, too, to keep the soil sweet. 2. Add a small mound of soil—about 1 1/2 in. deep. 3. Holding the plant in place, fill around it with soil. 4. Firm the soil around the stem, then eliminate any air spaces by striking the pot on the bench several times. Soil should be about 1 in. from top so there is room for watering.

Watering and feeding. When you water, do it thoroughly—add water until excess runs from the drainage hole. Water your plants in the morning because moisture lingering at night invites fungus disease.

Humidity. Since plants release moisture through their leaves, an occasional spraying with a fine water mist is helpful.—Harry Wicks, *Workshop Editor*.



Bolens Mulching Mower™ offers a new way to get rid of grass clippings.

Don't have any.

Instead of raking, bagging and hauling clippings, or watching them turn brown on the lawn, get a Bolens 22" Mulching Mower. When it cuts your grass, it also cuts and recuts the clippings into tiny mulch particles that get blown into your lawn. Too small to contribute to thatch build-up, they quickly decompose, re-cycling nitrogen back into your lawn.

So you save time and effort. And save again on fertilizer costs.

Since this mower doesn't throw out clippings, there's no discharge chute. So you mow with greater safety. And trim around trees and borders with both sides of the mower.

Other features include sure-footed front wheel drive. Grip 'n Go™ squeeze bar drive control. And your choice of manual or electric start. Also available in 22" and 18" hand-propelled models. See the complete line of Bolens outdoor power equipment at your nearest dealer. For his address, dial 800-447-4700 toll free anytime (in Illinois, dial 800-322-4400). FMC Corporation, Port Washington, Wisconsin 53074.



FMC Consumer
Products

Hideaways for kitchen and laundry

Finding additional storage space in your kitchen and laundry is generally a game of "seek-and-hide." Presented here are several game-winning ideas—from Maytag, the "inner" space experts when it involves washers and dryers.

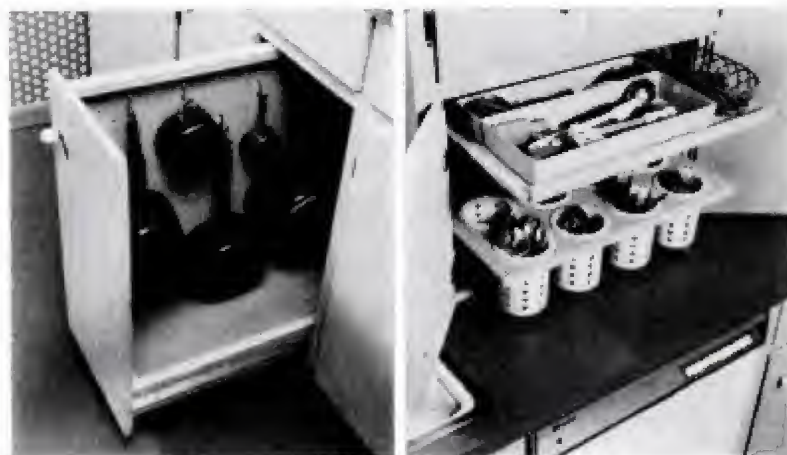
In the area between counter and cabinet and directly above the dishwasher, mini cabinets with slide-out shelves put unused space to great use. Incorporated into the existing upper cabinet, the extra cabinets house restaurant-type silverware canisters in a pull-out shelf to organize silver storage and make a short "trip" between dishwasher and cupboard. Canisters are available at restaurant-supply outlets.

In another example, pan storage takes on the ultimate in convenience when a base cabinet is customized with pegboard and hooks to create hanging space. Made to look like a door but to pull out like a drawer, the sliding unit makes the most of inches of space.

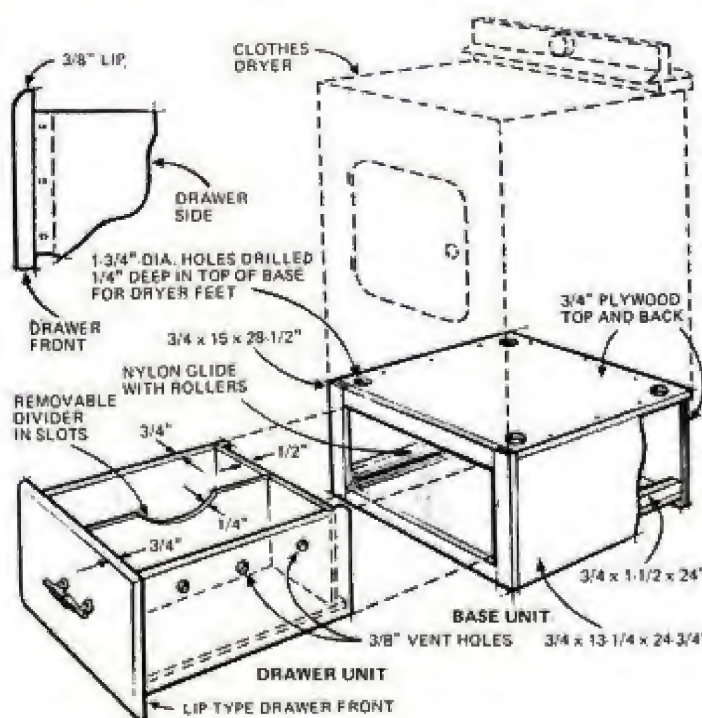
More lazy space that can be made to work for you is the area above a clothes dryer. Since a dryer does not have to sit on the floor, it makes sense to elevate it for two reasons. When placed



Pull-out shelves and bins close by dishwasher provide organized storage for pots, pans and silverware.



Elevated dryer rests on platform that has roomy storage drawer. Three tip-out bins alongside are for soiled clothes. Plan for making dryer platform is shown at right.



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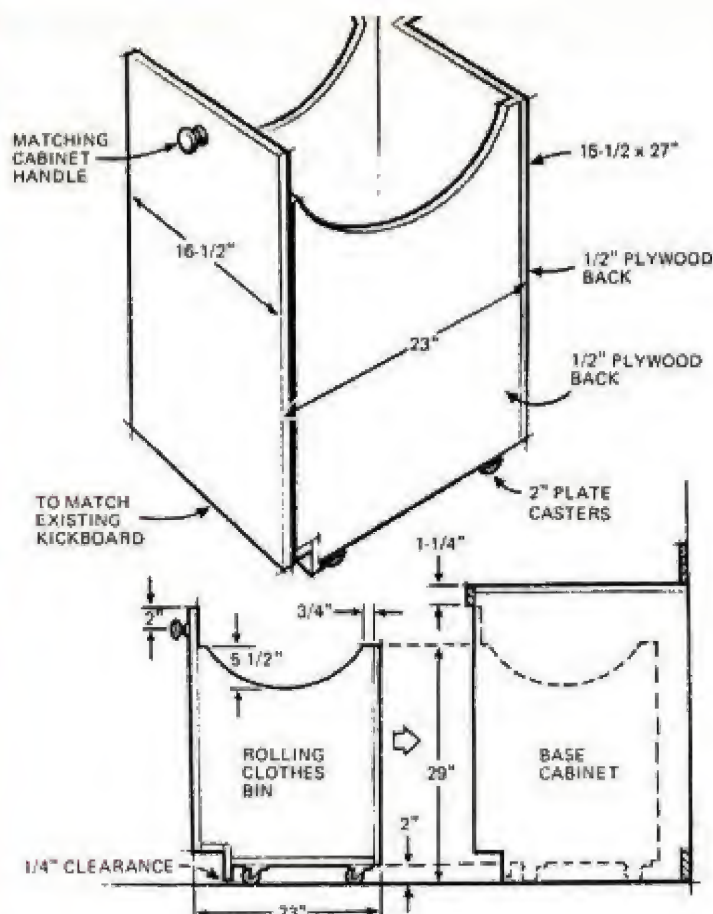
Roberts Consolidated Industries
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Manufactured in the U.S.A. © 1988 Weldwood Adhesives Division



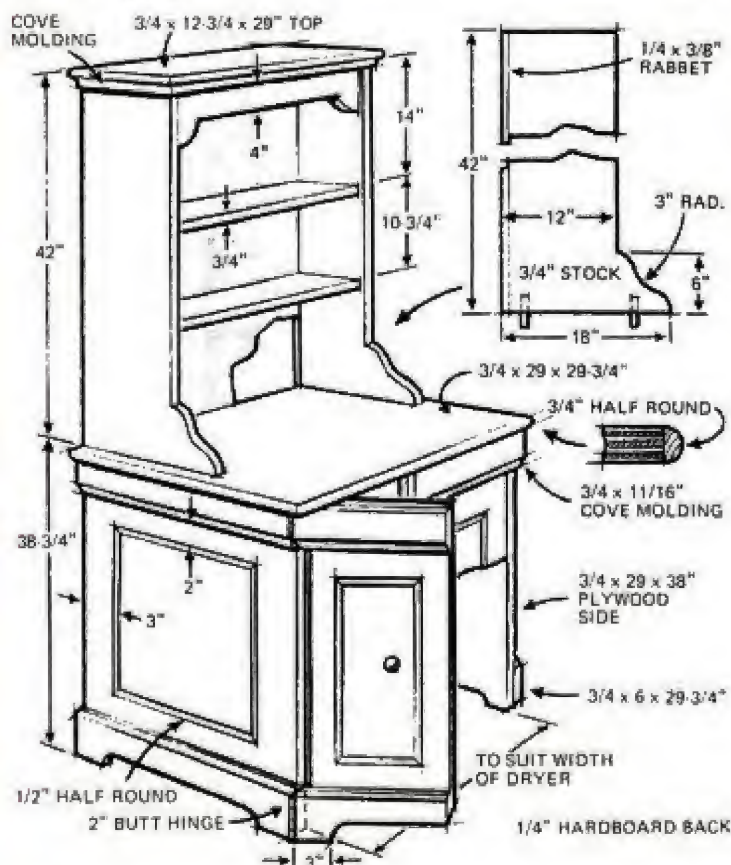
on a sturdy wood platform that's fitted with a drawer, you have a place for soiled clothes, and the dryer is up high where you can load and empty it without as much as bending a knee.

A roll-out bin that appears as just another cabinet when parked under a counter can make laundry chores a lot easier. You stash the soiled clothes in the bin as you collect them, then roll it back to the laundry room where color-coded sorting drawers are waiting to store the clothes until washtime.



When a kitchen is so small it even rules out a convertible dishwasher, there is no need to do without one—simply park it in the dining room in a "garage" that serves as an attractive hutch. When its doors are closed, no one would guess your dishwasher is inside. It's handy, too, for it can be loaded right at the dining table, then rolled to the kitchen and connected to the sink faucet. Plans for making this special cabinet are shown below. Plans for other clever spacemakers appear above and on the facing page.

★ ★ ★



LOOKING FOR IDEAS ON HUNTING, FISHING, CAMPING, BUILDING, TOOLS, ETC.? CHECK THESE LISTINGS, THEN USE THE COUPON BELOW.

WORTH WRITING FOR

358. Basement Magic

Here's the easy-to-follow plan for adding direct outside access to make your basement more useful, convenient and safe. It's all in a fully-diagrammed brochure from Bilco. Check it out! 10¢.

359. Heating and Cooling Money Saver!

Fiber glass insulation is easy to install and a positive fuel saver! CertainTeed has a comprehensive booklet that will show you where and how to do-it-yourself. Free

360. Don't Burn It—Bag It

Amerind-MacKissic offers the latest information on their rugged "Mighty Mac" shredder-grinders. Find out how these heavy-duty machines make light work out of disposing of your garden waste. Free.

361. Straight Talk On Caulk

Macco answers caulking questions in a quick reference brochure which describes types of caulk and methods of applications. From Macco Adhesives. Free.

362. Tough But Nice To Look At

Step-by-step instructions on how to build planters, decorative screen block walls, flower bed edging, patio floors, seating walls, barbecues, pools, steps and walks with Sacrete Concrete and Mortar Mixes. 25¢.

363. Quite A Bit About Bits!

Irwin Auger Bit's "How To Select, Use and Care for Wood Bits" tells all there is to know. Recommended and Free.

364. Home Protection

Solid vinyl siding—the most nearly perfect building material ever produced by science. No painting, can't blister or peel, easily cleaned. Interested? There's free literature from GAF.

365. Outdoor Projects!

Five new plan folders just released by Z-Brick show you how to build outdoor barbecues, storage sheds, wishing wells, decorative walls and a variety of brick planters and benches! 50¢ for full set of 5 plans.

366. Redwood Decks Do It!

Adding a redwood deck to your home means adding rustic beauty and solid resale value to your property. California Redwood Association offers a full-color, do-it-yourself "deck guide" that will show you how. Photo-illustrated too! 50¢.

367. PM's Famous Master Shop Guide

One of the most important tools you'll ever own! Lays out everything you need to know about nails, screws, bolts, drills, adhesives, lumber, masonry, plumbing and electrical work, 24 stand-up, hang-up, wipe-clean laminated pages, 56 charts plus a built-in ruler, protractor and compass. Solid value at \$4.49.

368. Professional Results!

A photo-illustrated, step-by-step guide to natural wood finishing! Floors, furniture, antiques, exteriors, boats—any wood surface and this thirty-one page brochure shows you how. From McCloskey. 25¢.

369. Cabinet Carnival!

A do-it-yourself manual that doesn't quit until you've got beautiful kitchen cabinets exactly where you want them. From first step to finished cabinet—everything you'll need to know—including diagrams. From IXL Furniture Co. 35¢.

370. Bird Tells All!

"What You Should Know About Roofing and Siding Before You Build or Remodel", is a beautiful, 32-page booklet packed with ideas, money-saving consumer advice, and full-color illustrations. 50¢ from Bird & Son, Inc.

371. Stop Dripping Faucets!

Vulcan Manufacturing has a Universal Faucet Reseating Kit: 8 tough stainless seats, 8 indestructible mated Delrin washers, installation kit and instructions. Permanently repairs any faucet that uses washers. Information with samples only 50¢ (refunded with any order).

372. Economical "Solar" Room!

Learn how many home owners are using prefab aluminum greenhouses to add economical all-glass, energy-capturing rooms. Informative 24 page, full-color catalog illustrates hundreds of styles and sizes. Free from Lord & Burnham.

373. Pumper's Attention

For pumping water from cellar, irrigating your garden, draining sinks and laundry tubs, circulating coolants, spraying gardens, or just using a pump for any number of other purposes! A "How To Pump It Guide" in wall chart format tells you how with diagrams and step-by-step instructions. From Labawco Pumps Inc. 25¢.

374. Paneling Guide

"All About Wall Paneling" from U.S. Plywood is a full-color, photo-illustrated booklet that covers paneling from A to Z. Over 50 illustrations, installation diagrams, easy-to-follow directions and color charts. 50¢.

375. Fun, Flavor and Savings!

You can't miss having a bountiful vegetable garden with a fantastic, full-color brochure from True Temper. From frost dates to companion plants, from soil types to composting, salad gardening, herbs, fruits, beans—all diagrammed so anyone can take it from the ground to the table! 50¢.

376. Do your home fix-up jobs easier

Colorful brochure gives details on the complete line-up of DAP fixer products. DAP fixes metal, gutters, panels, wood, windows—just about everything. From DAP, Inc. Free.

377. Ceiling Tile!

For safe, secure ceiling tile installation! Arrow has the tools and the guidelines in a concise brochure. Check the literature out. 10¢.

378. Energy Savers

Cut your heating and cooling costs with efficient weather stripping on doors and windows. Free brochure from Macklenburg-Duncan describes various types and sizes available in wood, metal or aluminum to fit your exact needs.

379. Shut John Up!

Stop that leaking, weeping, jiggling, squeaking, whistling, toilet from driving you crazy with a photo-illustrated brochure from Fluidmaster, Inc. Free.

380. Let Genie Do It!

Concerned about your family opening the garage door alone at night or just fed up with climbing out of the car to struggle with a heavy garage door? Genie Automatic Garage Door Opener, an incredible safety and convenience system might be the answer. Literature 25¢ from Alliance.

Popular Mechanics 475

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Please see that I receive the items checked below. I have enclosed 35¢ for the overall service charge, plus remittance for any priced items.

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| <input type="checkbox"/> 361 | <input type="checkbox"/> 365 (50¢) | <input type="checkbox"/> 369 (35¢) | <input type="checkbox"/> 373 (25¢) | <input type="checkbox"/> 377 (10¢) | |

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Note: Popular Mechanics processes your requests for the above information and forwards these inquiries to the organization making the offer. Each company mails the material directly. Please allow 4-6 weeks for delivery.

This Coupon Expires June 30, 1975

Big top in your basement



In days past, rumbling animals, tooting calliopes, brightly painted wagons and giant tents were all part of the scene when the circus came to town. But now, superdomes and concrete coliseums have replaced the tents, so there is little that remains of that part of the circus atmosphere.

The owners of this home wanted to recreate a reminder of pleasant days so they decided to use the circus as the theme for the family room in their basement. Under the guidance of a professional interior decorator, what had been just a storage area under the house soon was transformed into a room that promises good times.

Instead of hiding the foundation with conventionally framed and paneled walls, the finished room has bright patches of canvas stretched between and laced to vertical uprights. The latter are fastened to expander-type poles force-fit between floor and ceiling joists.

The tent-like illusion is enhanced by the colorful fabric suspended overhead on support wires stretched and fastened at opposite ends of the room. For added rigidity, short lengths of wires are fastened to joists at one end and to the support wires at the other end every 16 inches along the length of each support wire. You may have to shift these about so they do not interfere with placement of fabric over the support wires.

Using fabric on the ceiling is a practical way to finish a basement ceiling: Should the need arise to get at pipes or electrical wires that are suspended from or between the joists, you'll be able to do so with a minimum of effort and with no cost at all.

But, it was the attention given smaller details and extra touches that made the circus-theme come off successful. Those ideas used are original in concept and design; any or all of them can be duplicated by using imagination and care in their construction.



Circus theme creates an atmosphere of fun for children of all ages: accent ideas are both clever and original—stuffed animals romp in cages created by window treatment, a papier-mâché giraffe (fashioned on the Lally column) oversees all bar activity. The key to success when decorating with a theme—know when to stop adding such touches.



Whimsical clown-like robot in the center of the photo is simply a decorated house electric service panel. It was created by painting the conduit pipes and the box itself with bright colors and then adding a happy face. All details were carefully planned; the ceiling fixtures, for example, heighten the mood because globe shapes suggest balloons.

This circus came to town and stayed. As a result, good ideas abound in this family fun room. Wall and ceiling treatments are departures from the usual plywood paneling and square tiles. One-of-a-kind perky ideas make it all work. At left, the television set sits in a box painted and trimmed to duplicate the appearance of a traditional circus wagon. Foundation walls disappear behind strips of canvas laced to pole uprights. The tent-like look is assured by strips of fabric that are draped over wires securely fastened to the ceiling joists.



A looting calliope on the stairwall serves to house a hi-fi mounted on a sliding shelf. Elephant collage on far wall is of 1/8-in. plywood; it was inspired by children's book illustration. Other eye-catchers—use of canvas instead of conventional balustrades, uncovered Lally column which pretends to be a tent pole.

Since mending is often done in connection with washing clothes, a logical place for a sewing built-in is the laundry room. Complete with portable machine and a pegboard wall to hold patterns and sewing essentials, plus a clock and phone, the built-in sewing nook at right is an idea from Maytag that makes good sense.

Three flush doors supported by four two-drawer file cabinets placed along a wall make a complete sewing center (below left). The file cabinets provide eight roomy storage drawers for yard goods and patterns galore, and the long counter gives all the room in the world to lay out and cut a pattern.

An unusual way to find space for a sewing center is in a spare bedroom closet (below, right). Folding doors cover the opening when you close up shop. ★ ★ ★

Sewing built-ins for any room



Built-in next to the washer, this tidy sewing center is handy for sewing a rip in Junior's jeans prior to tossing them in the machine. The "cabinet" located at the left of the sewing counter is the rolling clothes bin shown on page 126.

*Home
Ideas
Guide*

This sewing built-in was once a spare bedroom closet. Machine counter 30 in. high provides kneehole; shelves hold sewing supplies; folding doors hide all.



A quickie to rig is this "built-in." Counter is supported by common metal file cabinets. Kneeholes and chairs provide comfort at each sewing station.



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Old Orchard



"We always wanted a country place. But we never dreamed we could afford one.

"Then we saw Country Place."

"It's the super new Weldwood® paneling with the weathered barn siding look. It even has knotholes!

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"It was easy to put up too. My husband used ordinary tools he has around the house. Installed it right over our old walls. And did it all over a weekend.

"All About Wall Paneling showed him how. It's a booklet we got with the paneling at our U.S. Plywood Dealer.

"Country Place. It doesn't cost that much. It's beautiful. It's built to last year-in, year-out. And that's terrific!"

You can see Country Place at your local U.S. Plywood Dealer. He's listed in the Yellow Pages under 'Paneling.'

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PANELING
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It's like furniture for your walls.



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Extra storage is everywhere



Occupying no more than 6 feet of space, this island clothes-sorting cabinet, with its many drawers, makes a perfect companion for any washer/dryer.

Wish you had more room to store things or to work in? Chances are you have the space but may not be aware of it. Three ideas shown here are good examples of how different areas of your home can be made to serve more efficiently.

As pictured above, a soiled-clothes-sorting cabinet alongside a washer and dryer can add a world of convenience and efficiency to a home laundry. The pretreatment sink doubles as a member of your laundry team and a cleanup area for messy fingers.

A wall-supported counter fitted with drawers and equipped with bar stools (upper right) provides a work/study area for the whole family. Each youngster can have his own "desk" for homework or craft activity. Mom will find it a great place to budget the family paycheck and plan menus.

An attic room's sloping walls offer storage opportunities galore using space "back under" to provide room on open shelves and in cubbyholes for countless items. Standard window shutters (right), hinged and held shut with magnetic catches, make attractive and inexpensive doors. ★★★



Solidly supported by protruding 2x4s anchored to wall studs, Formica-covered counter provides several study and play areas, each complete with drawer.



Low-bridge areas back under sloping roof of attic rooms are waiting to store countless items such as luggage, Christmas decorations, seasonal wearing apparel and the like.

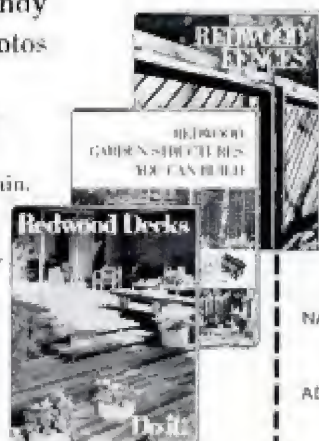
Garden Redwood.



You can build a deck like this for a lot less than you think!

Use the garden grades of California's luxury lumber. The knots and sapwood streaks that make garden redwood less expensive also give it a rustic look and texture ideal for outdoor use. Our handy Redwood Decks Kit features color photos

of dozens of deck and fence installations—schematic drawings of deckboard patterns you can use—and practical tips, like the ones shown here, on how to buy, handle and finish garden redwood for best results. Use the coupon to order your Kit.



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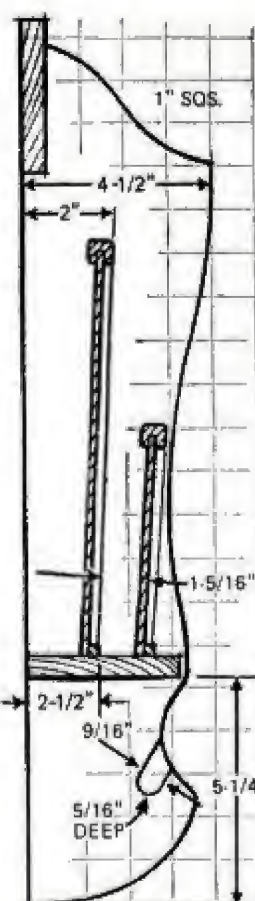
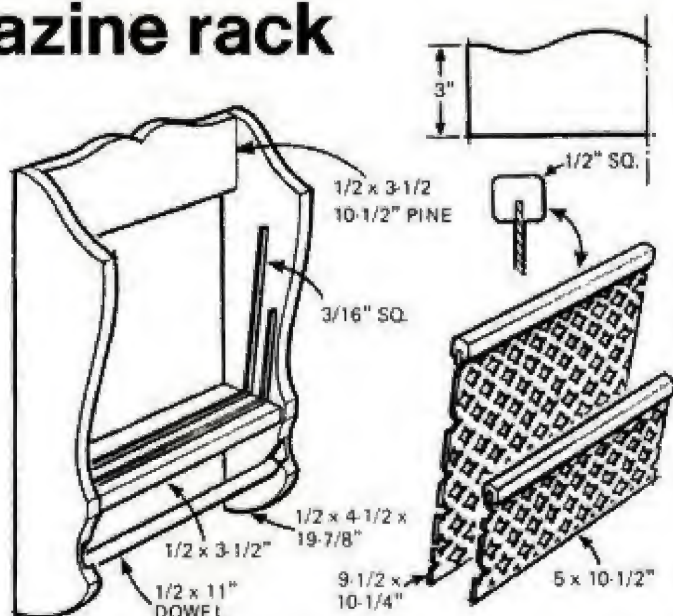
I enclose \$1.00 for your REDWOOD DECKS Kit.

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Bathroom magazine rack



A wall-mounted magazine rack for the bathroom keeps reading materials handy. This rack holds not only magazines but two rolls of toilet tissue on a removable rod. Both side members are scroll-cut at one time, then made right and left hand when forming slots for the paper-holder rod. If you plan to paint the rack in two colors, it is best to do so before installing filigree panels.—*Rosario Capotosto*



Open slots are formed with straight-shank router bit.



Slotted strips are glued to top edges of filigree parts.

Snapper is fast.



This means Snapper mowers combine outstanding design features that help you get through with the work of caring for your lawn faster, and easier.

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All you need are a few simple hand tools, plywood, a few cartons of Z-Brick, and our easy-to-follow plans.

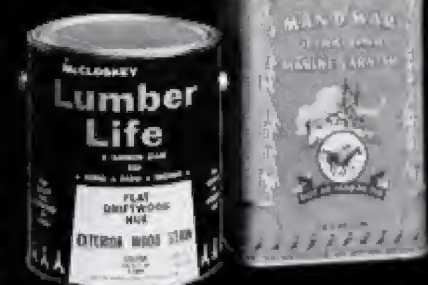
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Two durable choices from McCloskey make caring for wood an easy job.

On a house, wood looks terrific. On a boat, it adds class. The trouble is the weather. Wood must be protected. Lumber Life Wood Stains for distinctive color and Man'O War Ultra Marine Varnish for vibrant, clear gloss, give that protection.

Lumber Life offers a choice of 12 rustic colors. All go on easily and penetrate deep into the wood to enhance the texture.

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Varnish Company Los Angeles, Cal.

Handy little Devils for nasty little jobs.

Patching... caulking... whatever the job, top-quality Red Devil tools and chemicals make it easy!



For patching holes and cracks, use a quality spackling compound like Red Devil ready-mixed Patch Paste® — and a Red Devil Putty Knife. Red Devil Putty Knives are so ruggedly built, you'll never need to replace one unless you lose it!



To seal cracks around tubs, sinks and showers, apply a bead of Red Devil Tub & Tile Caulk from its handy tube. Perfect for resetting loose tiles, too!

It's easy...
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Red Devil

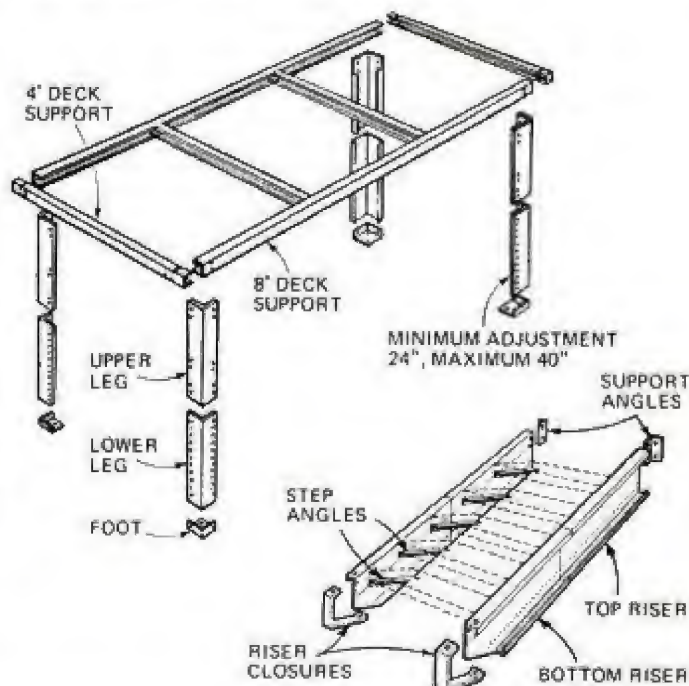
Red Devil Inc.
Union, N.J. 07083



New modules for easy deck building



While this deck is shown without railings, it is best for safety to add railings to yours. Note flexible arrangement this system permits.



There's an easy way to build a deck these days, thanks to a steel modular system that goes together like an Erector set. Each 4x8-ft. unit, complete with adjustable legs, can be bolted together end to end or side by side to make a platform of any

size and shape by simply adding as many individual units as you wish. How you cover the steel platform is up to you. You can top it with 4-ft. redwood planks laid checkerboard style, or with 3/4-in. exterior plywood and fitted with indoor-outdoor carpet.

Adjustable bolt-on steel stair stringers in this modular system can be attached anywhere. Stringers cost about \$42, 4x8 unit with legs about \$65. For more information write Mastic Corp., 131 South Taylor St., South Bend, Ind. 46624. ★ ★ ★

Folding shower door installs in 30 minutes

Folding door slides in tracks at top and bottom, making cleaning of tub and bathing of children easier because full access to tub is assured.



Stop costly drafts around your doors!

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MACKLANBURG DUNCAN CO.
energy savers

You can save up to 30% on home heating cost by properly sealing around your doors with M-D weatherproofing products. They come packaged, ready and easy to install.

M-D JAMB UP WEATHERSTRIP. Rigid, no rust aluminum with vinyl insert makes a tight seal around drafty doors.



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Available at your hardware, building supply or home center dealer.

Ask for M-D by name.

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P. O. BOX 25188 OKLAHOMA CITY, OKLA. 73125

Though many believe that installation of a bathtub shower door is best left to professionals, the project is actually relatively simple—well within the skills of most home handy-men.

Besides its good looks, the door shown has a big advantage over its bypassing (sliding door) cousins. Unlike the latter, which screen off half the tub opening, this door stacks within 8 in. of the wall to give full tub access with the door in the open position.

Installation goes quickly; instructions packed with the door are clearly written and well illustrated. The bottom track rests on the tub with beads of caulk beneath. When both verticals are screw-fastened to the walls, the bottom track is held immobile. The

top track engages the verticals and then the door—which comes pre-assembled—is placed in position.

The entire job will take anywhere from 30 minutes to one hour depending upon your skills. Top and bottom track, of course, must be cut to suit the tub length.—*Harry Wicks, Workshop Editor*

SPECIFICATIONS Folding Shower Door, Model BT

Sizes: To suit all major-make bathtubs
Available colors: 14
Frame colors: Gold or silver
Intermediate panel color: White only
Prices: Standard unit \$51 to \$90; custom units run higher
Manufacturer: Tub-Master Corp., 413 Virginia Dr., Orlando, Fla. 32803



Vertical frame members are waterproofed using caulk strips packed with doors. Strands must be placed without breaks.

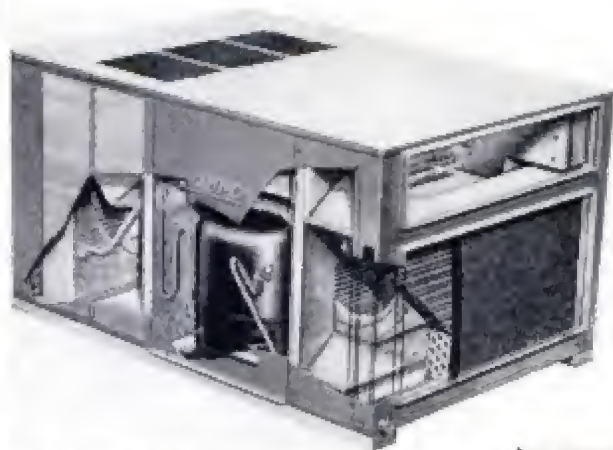


Plastic clips (center photo) on both ends of header track serve as stops; preassembled door is then engaged in track.

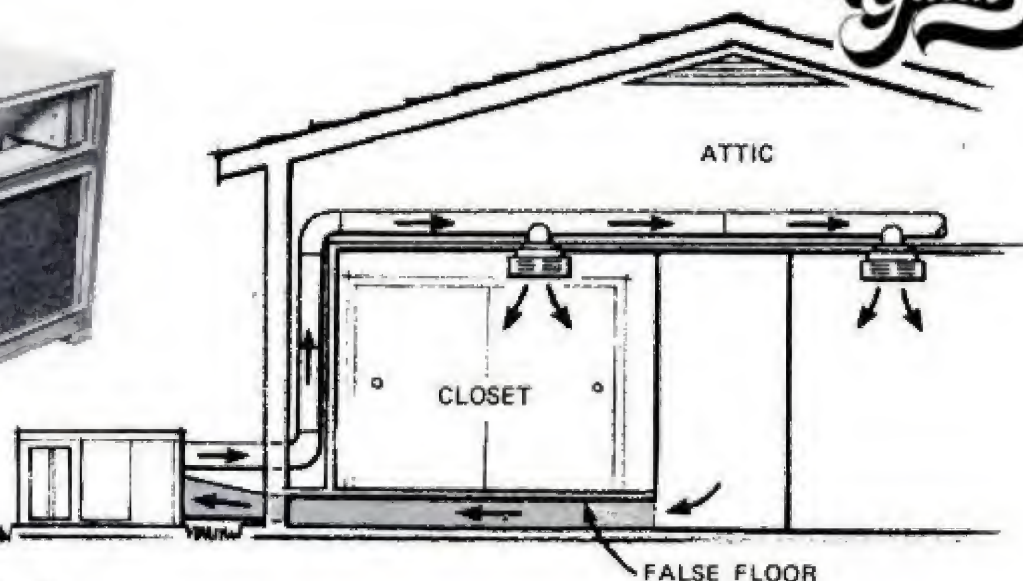


New products of special interest

*Home
Ideas
Guide*



Cutaway (above) shows the compressor in center of insulated compartment to deaden operating sound.



Year-round comfort in one compact unit

Ideal for slab-home installation, this new air conditioner for central cooling (with optional heating) makes it easy for anyone with a basement-less home to add year-round comfort with a compact all-in-one unit. Available in two to five-ton sizes (24,000 to

58,000 B.T.U.), the CHA9 unit, introduced by Lennox Industries, Marshalltown, Iowa, 50158 sits outdoors and has an over-and-under air-distribution system (rather than side by side) to speed duct connection. A typical use runs duct supply up the end of a

closet into attic to feed high sidewall diffusers. Return air duct goes to a false floor in the closet and air is pulled from a central hall, as shown above. See your Lennox dealer or write manufacturer for prices.

(Please turn to page 138)

SUPER CAULK™ Guaranteed for 20 Years

- Macco Acrylic Super Caulk will not lose adhesion, crack, bleed, stain or discolor
- Adheres to all common building materials
- May be painted within 30 minutes with oil base or latex paints
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- For use inside or outside the home



Guarantee: Macco Adhesives guarantees that if Macco Acrylic Super Caulk is used as directed and fails within 20 years after application, Macco will replace an equal amount of material at no cost after inspection, and upon submission of proof of purchase to Macco. This guarantee applies to residential use only.

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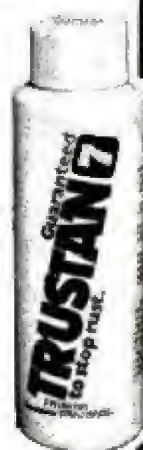
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All you do is brush Trustan "7" on the rusted surface, overnight it converts the rust into a blue/black impermeable shield eliminating the existing rust and protecting against future rusting. 7 oz. container will eliminate 50 sq. ft. of rust.

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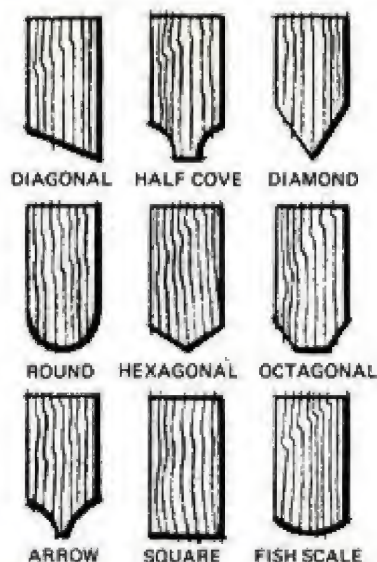
NEW PRODUCTS

(Continued from page 137)



Fancy house shingles

Artistic patterns of the past are offered by Shakertown Corp., Winlock, Wash. 98596, with its Fancy Butt Western red-cedar shingles. Nine attractive patterns give many texture possibilities for interiors and exteriors. Carton of 160 shingles covers about 33 sq. ft. Check dealer or Shakertown for prices.



Install-it-yourself opener

A planetary gear system replaces old belt drive in the new Genie radio-controlled garage-door opener, making it virtually wearproof. Exclusive quick-release handle disconnects instantly and reengages just as easily. Designed for do-it-yourself installation, Model 200RS comes with AC30 radio in single 3-ft. carton. \$139.95. Made by Alliance Mfg. Co., Alliance, Ohio 44601.

You can do it, too! Peerless WASHERLESS faucets

Do-it-yourself! Save a bundle! And do away with old-fashion washer headaches forever! Peerless has taken the troublesome compression washer out of faucets...a revolutionary design that has proven superior in millions of homes. You can do it with Peerless single-handle, or two-handle faucets. In the kitchen, bathroom sink, tub or shower. Ask for Peerless Faucets in Hardware, Building Supply, Discount and Home Center stores near you.

Step-by-step illustrated instructions



Every Peerless package contains easy to follow illustrated instructions. You just follow the pictures to install, save, and modernize your home.

**PEERLESS
FAUCET**



P.O. Box 31, Greensburg, Indiana
A Division of Masco Corporation





Kit is shrink-packed on a 24x30-in. card with detailed illustrations and instructions printed on the back.

Dishwasher replacement kit

Replacement of an old built-in dishwasher with a new General Electric model is reduced to a simple task by a kit of parts that require no soldering and can be installed with only a screwdriver, wire cutters and an adjustable wrench. You get a length of rubber drain hose, hose clamps, copper tubing, brass tubing connectors, electrical solderless connectors and

a test light, plus detailed instructions and illustrations that take the handyman through 17 simple steps required to remove the old built-in appliance and install the new model. Dealer charges for the installation of a dishwasher range between \$40 and \$60. The replacement kit, which costs \$14.98 from GE, is available at appliance stores.



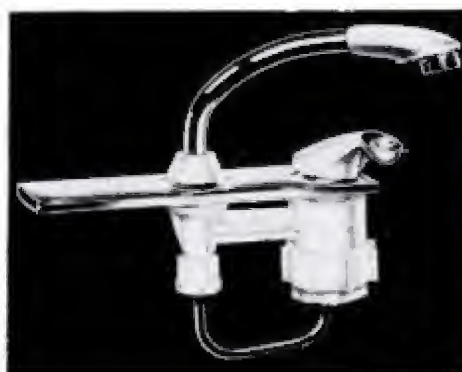
Cool it yourself

You can aircondition your home for as little as \$500 with a do-it-yourself kit you can install yourself with a few simple hand tools. Manufactured by the McGraw Edison Co., Albion, Mich., the kit includes all components: condensing unit, cooling coil, refrigerant tubing, automatic controls and accessories. The condensing unit sits outdoors while the cooling coil mounts in the plenum of a forced-air furnace. There is a wide selection of kits available; the cost will vary according to the size and type of your home.

Low-cost single-lever faucet

Called Aquamix, a low-cost kitchen-sink faucet by American-Standard features a single-lever control that lets you adjust water temperature and flow in one simple motion. Aerator spout turns 360° at base; spout head swivels 45° right or left to rinse any part of sink. Cartridge has two ceramic discs to adjust flow from a trickle to a blast. About \$23.

(Please turn to page 140)



Two more ways to be a hero in your own home!



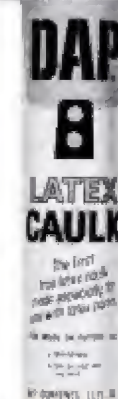
Dress up a bathroom

It's easy with DAP Kwik-Seal® Tub & Tile Caulk. Makes a neat, white, watertight seal around tile, tubs, sinks, showers. Grouts tile. Caulks window and door frames. Stays flexible. Takes paint.



Keep your house snug

Seal-up cracks and joints inside and outside your home with DAP Latex Caulk. Keeps heat in—cold out. Guns easily, sets fast for painting in 2 hours. Won't stain, bleed or show through latex or any other paint.



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**SHOOTS A STAPLE
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This powerful Arrow all-purpose tacking tool automatically drives staples with one squeeze ease . . . into the hardest wood, plywood, composition board, Masonite, plastic — even soft metal! One-hand operation leaves other hand free. All-steel with chrome finish. Jam-proof.

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PLUS screens, window shades, valances, upholstery, closet linings, shelf trimmings, wires, rug paddings, wire fencing, wall decorations — and many more

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271 Mayhill Street, Saddle Brook, N. J. 07663
The Standard of Excellence
By Which All Others Are Judged.

NEW PRODUCTS

(Continued from page 139)



Do-it-yourself parquet

Multiple plies of cross-grained oak bonded with waterproof glue produce this handsome Haddon Hall (Old English) laminated parquet flooring. Factory-finished and wire-brushed for antique look, the mellow-brown tile measures 1/2 x 12 x 12 in., has cotton mesh backing, is laid like any resilient tile floor. Bruce Flooring, Box 397, Memphis, Tenn. 38101.



'Waxable' wood-grain laminate

A "natural finish" wood grain that comes to life with a touch of spray wax is the newest in the Nevamar line of special-surface, high-pressure plastic laminates. In its nonwaxed state, the wood grain—Silvan Teak—looks like untreated and unfinished wood. Like real wood, however, it gains a lustrous shine when given a coat of spray wax. Exxon Chemical Co., Odenton, Md. 21113. ★ ★ ★

McCulloch Portable Generators.

**Electric power
when you want it,
where you want it.**



H-1500 1500 watt capacity, 68 lbs.,
115 volts, 60 cycles



H-2000 2000 watt capacity, 83 lbs.,
115 volts, 60 cycles



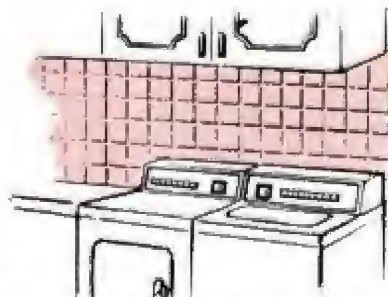
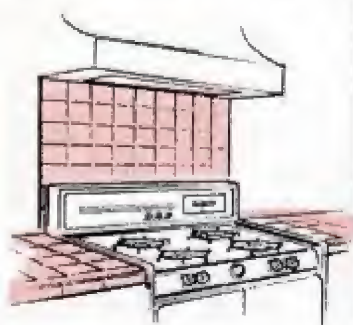
H-3000 3000 watt capacity, 129 lbs.,
115/230 volts, 60 cycles

This may be the year you'll need portable electric power more than ever before. And McCulloch generators, with only one moving part, are the most reliable you can buy—at the best values anywhere. Lightweight, and compact enough to fit in your car, too. McCulloch also makes the dependable lightweight, low-priced Mini Mac chain saws. So see your McCulloch Dealer in the Yellow Pages under "Generators" or "Saws."

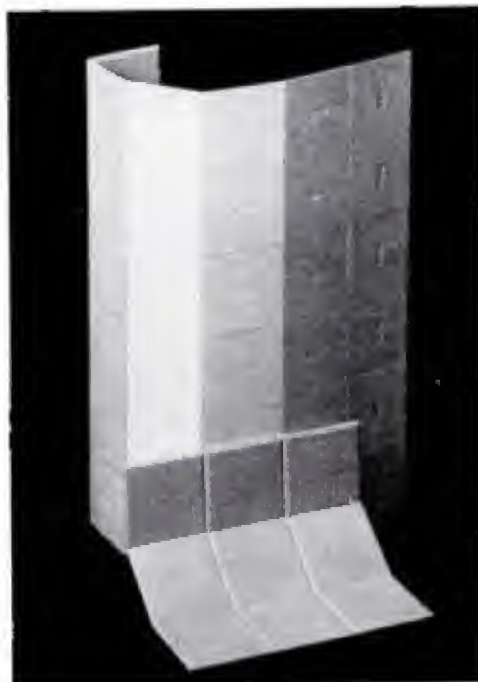


MCCULLOCH
CORPORATION
Los Angeles, California 90009

Rubber-jointed ceramic tile: quick and easy



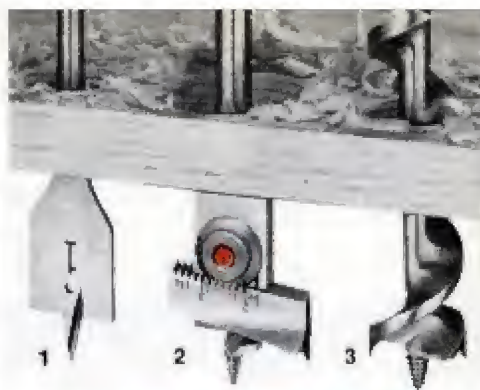
Preassembled 12-in.-sq. sheets go on fast. Joint spacing has already been set; you simply press the sheets firmly in the adhesive after butting their edges tightly together.



Six colors are available. Five 12x12-in. 9-tile sheets total \$9.45; eight tub-surround sheets of 49 tiles each, about \$100.

Do-it-yourselfers can now buy genuine ceramic tile in pregrouted sheets. American Olean Tile Co., Lansdale, Pa. 19446, is now offering two basic systems, both called Easy-Set, in which the tiles come mounted in sheets and joints are prefilled with a silicone rubber that stays permanently flexible. One system consists of 12x12-in. sheets of nine tiles each for walls, vanity tops, backsplashes and shower and tub surrounds. The second comprises a packaged tub surround of eight large sheets of 49 tiles each, plus cover.

With the tiles preassembled in easy-to-handle sheets, tiling goes fast with less mess. The sheets are cemented to the wall with a water-resistant mastic. Butting joints are filled with Dow Corning 734 sealant applied with a caulking gun. Joints are smoothed and excess sealant is removed with cheesecloth and denatured alcohol. Tile, adhesive and sealant, even a rentable tile cutter, are available at Sears.



3 easy ways to bore holes faster

1. Irwin Speedbor® "88" wood bit for all electric drills. Spade-type head, exclusive hollow ground point. Starts fast, cuts fast. 17 sizes, 1/4" to 1 1/2", and sets.
2. Irwin No. 22 Micro-Dial® hand brace expansive bit bores 35 standard holes, 7/8" to 3". Just dial your size. No. 21 bores 19 standard holes, 5/8" to 1 3/4".
3. Irwin 62T Solid Center hand brace bit. Delivers double-cutter boring action. Medium-fast screw pitch. Balanced cutting head. 18 sizes, 1/4" to 1 1/2", and sets.

Every Irwin Wood Bit precision-engineered of finest tool steel, heat treated full length and machine-sharpened. They last, bore fast. Buy Irwin . . . buy the best.



Speedbor® "88" Sets, 6 and 13-bit sets in metal storage rack.

Strait-Line® Chalk Line Reel Box 50 ft. & 100 ft. sizes

Popular-priced Irwin self-chalking aluminum alloy box. Easy action reel. Leak proof. Practically damage proof. Fits pocket or hand.



IRWIN every bit as good as the name
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In just a few hours your family can enjoy the comfort and convenience of a Genie Automatic Garage Door Opener System... the system most people know and prefer.



1 Attach mounting bracket



2 Attach power unit to ceiling



3 Mount door arm



4 Connect radio receiver



5 Installation complete



6 Genie's ready to enjoy

Thoroughly tested and UL listed. Solid state radio controls certified to comply with FCC regulations.

Genie

automatic garage door opener system by Alliance.

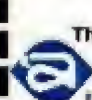
For a free Genie do-it-yourself brochure, mail this coupon today or visit your nearest Genie dealer, The ALLIANCE Manufacturing Co., Inc. Alliance, Ohio 44601 Dept. PM-4

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The **ALLIANCE**

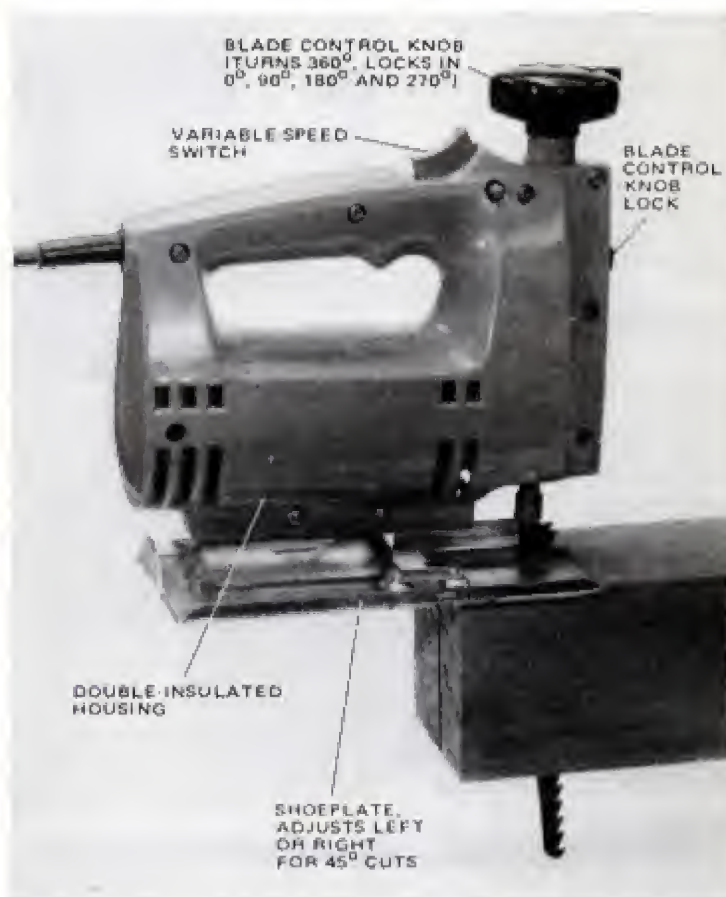
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Maker of the famous Antenna Rotator, Alliance Tenna-Rotor™, "TV's Better Color Getter!"

SHOP-TEST REPORT

Scroll-cutting sabre saw

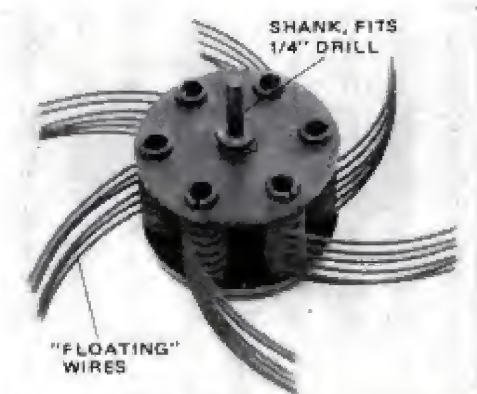


A couple of interesting features justify a shop test of Wen's Model 531 Scroller Sabre Saw, even though it's not spanking new. Most intriguing is the rotating blade controlled by a knob at the top. This is a good feature on tight turns—because you turn the blade only—but I found it a bit stubborn to work with and, at times, difficult to adjust. The tool's strong feature is its variable-speed range; slowing down the strokes-per-minute is what really lets you negotiate tricky cutting lines. The speed is controlled manually by varying pressure on a convenient, thumb-button switch. Conclusion: Try it in the store; if you like the tool's heft, it's a buy at \$40.—*Harry Wicks, Workshop Editor*

SPECIFICATIONS—Wen Model 531 Sabre Saw

Motor: 4-amp., 3/4 hp. Rated heavy duty by maker.
Blade: Rotates 360°, can be locked in four positions—0°, 90°, 180° and 270°.
Variable speed: 0 to 2800 strokes per minute. Locks in two speed positions—intermediate and full.
Housing: Unbreakable, double-insulated, has lifetime guarantee.
Bearings: Lifetime-lubricated bronze and needle bearings.
Shoeplate: Adjusts right or left for 45° cutting.
Price: \$39.95.
Manufacturer: Wen Products, Inc., 5810 Northwest Hwy., Chicago, Ill. 60631.

Rust remover you can use in your drill



Despite odd looks, tool quickly proved to be an effective paint and rust remover.

Recently, was shown the strange-looking tool above and asked to try it and report my findings. My initial reaction was: "Spare me from paint removing—too much work!" But within 15 minutes, I realized that this tool does, in fact, make paint removing easier. Called Surface Remover, the device can be used in any 1/4-in. electric drill.

Though ungainly looking, the tool's floating wires *do* remove rust from metals rather effortlessly; the heavily oxidized pick-mattock shown was entirely cleaned of rust in about 30 minutes. I also tried the accessory on some thick, alligator-siding paint which it removed efficiently, but I learned that the tool, if held in one spot too long, also damages the wood substrate. At \$10, it's a dandy aid for those who frequently have such removal tasks.

—Harry Wicks, Workshop Editor

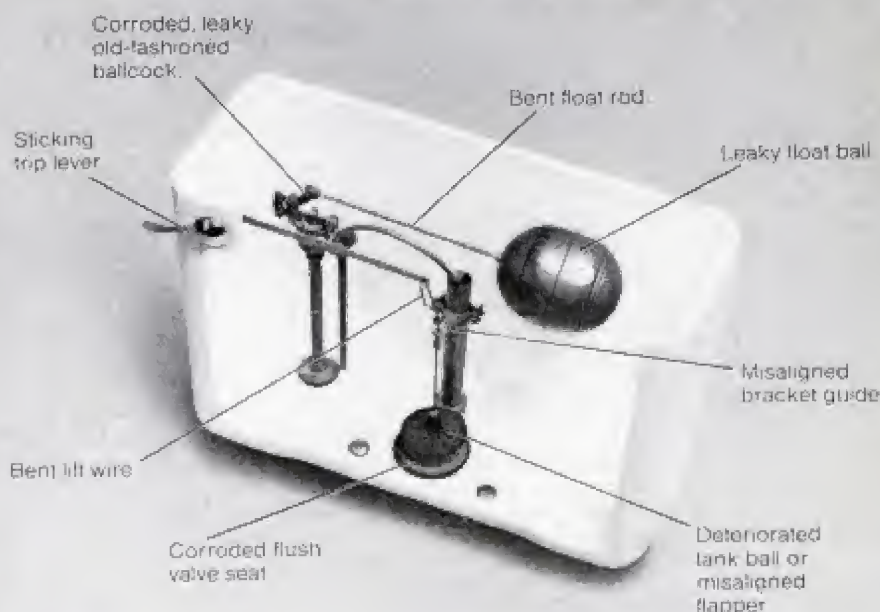
SPECIFICATIONS Surface Remover

Use: Attachment for any 1/4-in. electric drill
Tool rotation: Clockwise (when viewed from behind drill)

Recommended drill speeds: 1750 rpm—good
2000 rpm—better
2250 rpm—best
2500 rpm—maximum

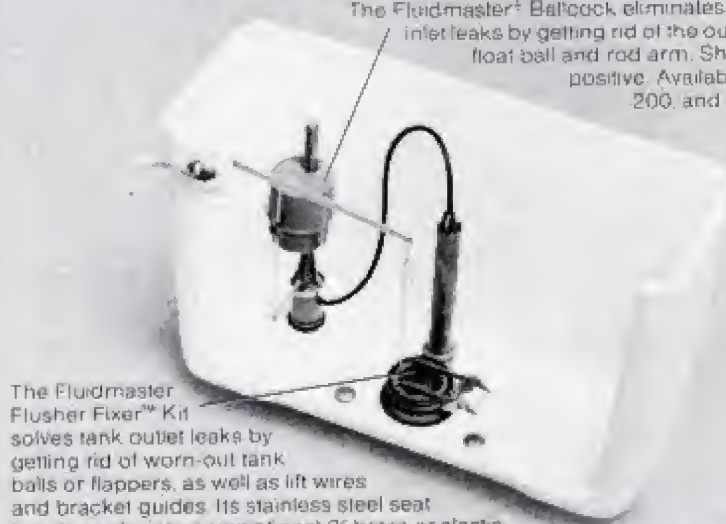
Price: \$9.95 plus 50 cents for postage and handling
Manufacturer: The Thompson Tool Co., 1 East Lakeview Dr., Norwalk, Conn. 06850.

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What makes Johnny stop.

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Credits for PM's Special Home Ideas Guide

Page 111: Illustration, Roy Grinnell.

Pages 113-115: Deck, photos, Ernest Braun; design, John Matthais for California Redwood Assn.

Pages 116 and 118: Design, Tom Fong; photos, Stephen Fay; cabinetry, Everett Johnson.

Pages 120 and 122: Living wall planter by Robert Dougherty for U.S. Gypsum Co.; contemporary planter by David Painter; photos, Hedrich-Blessing.

Pages 124 and 126: Design, Maytag Co., Newton, Iowa.

Pages 128-129: Basement ideas, architect Eugene Volta and designer Lucille Knoche, FIDI,

for the Canvas Awning Institute; photos, Hedrich-Blessing.

Page 130: Data, Ann Sukov, Ross and Lifson residences; photos, Les Turnau; laundry sewing nook by Maytag Co.

Page 132: Island clothes storage by Maytag Co.; wall desks, Ethel Samuels, decorator N.S.I.D.; photos, Hedrich-Blessing; attic storage, design, Norman Steenhof for U.S. Gypsum Co.; photos, Hedrich-Blessing.

Page 134: Photos, author Rosario Capatosto.

Page 136: Accordion shower door, lead photo, Tub-Master Corp.; how-to photos, Robert D. Borst.

How to troubleshoot your electric range

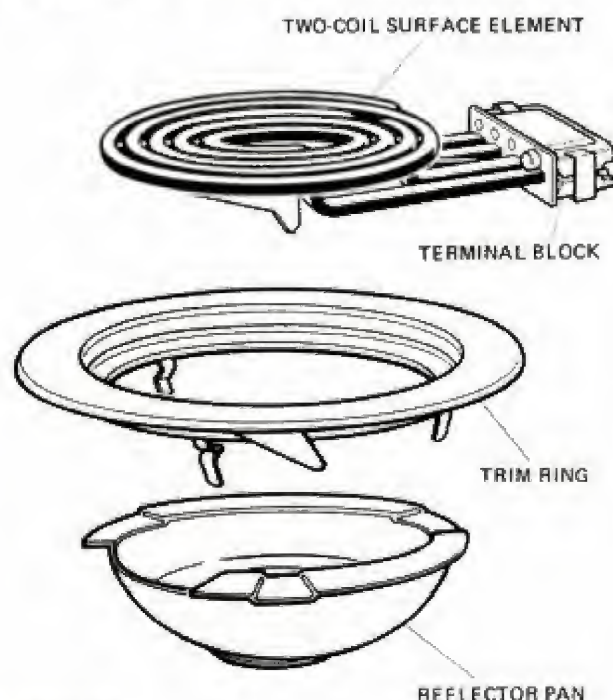
Oven does not heat

| POSSIBLE CAUSES | WHAT TO TRY |
|---|--|
| 1. Fuse blown or circuit breaker tripped. | Replace fuse or reset circuit breaker. If blowing or tripping is repeated, disconnect the power and check for shorts. |
| 2. Automatic timer set improperly. | Make sure timer is in "manual" position for everyday cooking. Refer to manufacturer's instructions. |
| 3. Automatic timer defective. | Check timer for defective motor or contacts (see clock-timer discussion on last page). If gears are bound or broken, repair or replace timer. |
| 4. Selector switch set improperly. | Make sure that selector switch is set for type of cooking desired. |
| 5. Thermostat defective. | Place voltmeter across thermostat input terminals; reading should be 230 v. Loosen bake element in oven and pull it forward a fraction of an inch to make terminals accessible; turn thermostat on and check voltage across bake-element terminals; reading should be 230 v. Otherwise, thermostat is defective and must be replaced. Check thermostat's broil operation the same way. |
| 6. Element(s) defective. | Inspect bake and broil elements for breaks or cracks. Check elements one at a time as described above; if voltage is present but element does not heat, replace it. |
| 7. Wires loose or shorted. | Disconnect power, check wiring for breaks or charring. Replace damaged wires. Be sure connections are tight. |

Your electric range is one of the simplest appliances in the house—it's really just heating elements and their controls. Although it uses 230-v. power, it's no more difficult to troubleshoot than a 115-v. appliance, so long as you show the respect you always should for the potential danger of electricity. And while the controls used on ranges have become increasingly sophisticated over the years, their basic principles have not changed. Whether your range is free-standing, built-in or a cooktop, you can use the following charts to solve nearly any range problem you have.

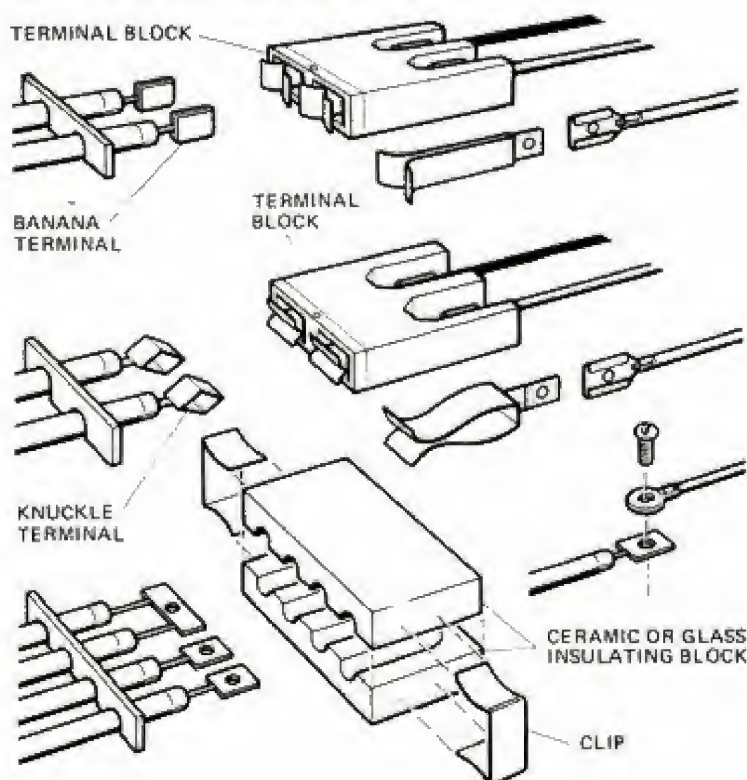
Most electric ranges have four surface elements, two large ones and two smaller ones. The large elements can have a wattage of 2100 to 2600 w., while smaller ones range from 1150 to 1500 w. Older surface elements consisted of an open coil of wire fitted into a ceramic block. Elements of this type are rarely seen today, except on hotplates, as they burn out easily. They have been replaced by hermetically sealed elements like the one shown below and to the left. This element has a Ni-

Surface-element assembly



Art: Peter Trojan

Surface-element connections



chrome resistance wire embedded in an insulating powder, usually magnesium oxide, housed in D-shaped stainless-steel tubing. The insulating powder keeps the resistance wire from touching the tubing sheath and causing a short or ground.

A surface element has either one or two resistance elements and two or four connections. For these connections, one of three types of terminal—banana, knuckle or screw-on—is used. These terminal types are shown on the preceding page. A terminal block used with the surface element provides a positive connection point between element and switch wiring. Terminal blocks are usually attached to the underside of the cooktop with a screw. Screw-on terminals have, instead of a terminal block, a glass or ceramic covering over terminal ends to prevent shorting. Problems that can arise with surface elements are shorting, breaks in Nichrome wire and pitted or corroded terminals; terminal blocks are also subject to corrosion and pitting, and to damage from internal arcing.

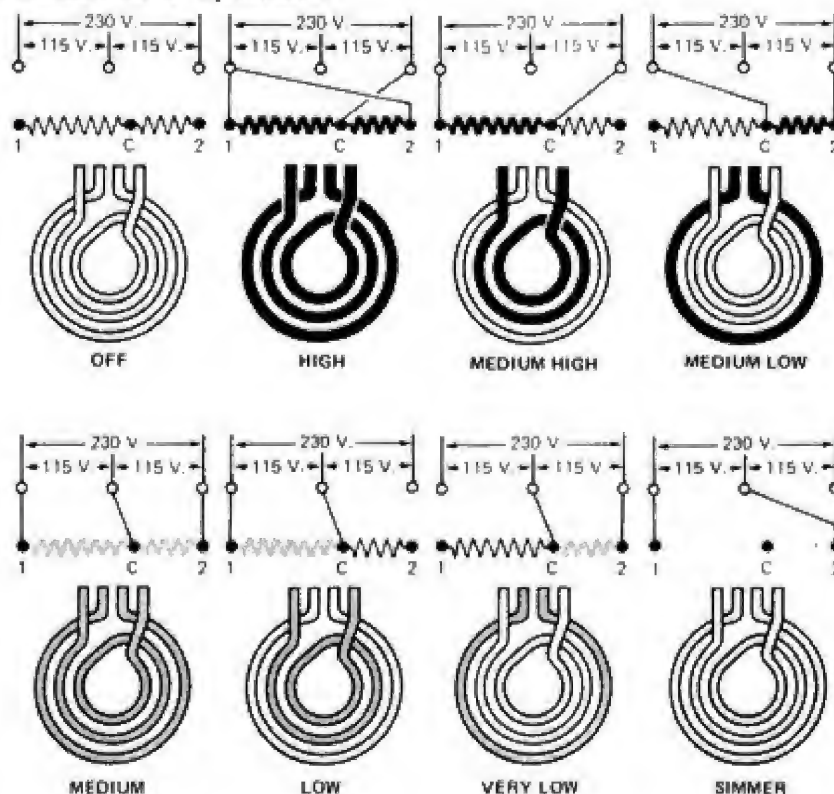
Surface switches are used to regulate the amount of heat produced by surface elements. The switches most commonly used are the step switch

Oven temperatures are uneven

Date: Ed. Franzese

| POSSIBLE CAUSES | WHAT TO TRY |
|-----------------------------------|---|
| 1. Thermostat out of calibration. | Check oven temperature with an accurate mercury thermometer. Recalibrate thermostat according to the maker's instructions. |
| 2. Door gaskets defective. | Open oven door and inspect sealing gaskets; replace any that are worn, cracked or flat. |
| 3. Door fit uneven. | Check door alignment; if adjustment is needed, loosen door-hinge screws, realign door, then retighten the screws. Check door springs, too; adjust for equal tension if necessary. |

Seven-heat switch operation



Caution: Be sure power is turned off before you handle components. Make all continuity tests with power off. Do not attempt to make live voltage checks unless you have experience with the use of test equipment. Use the maker's wiring diagram, and use only replacement parts that meet his specifications.

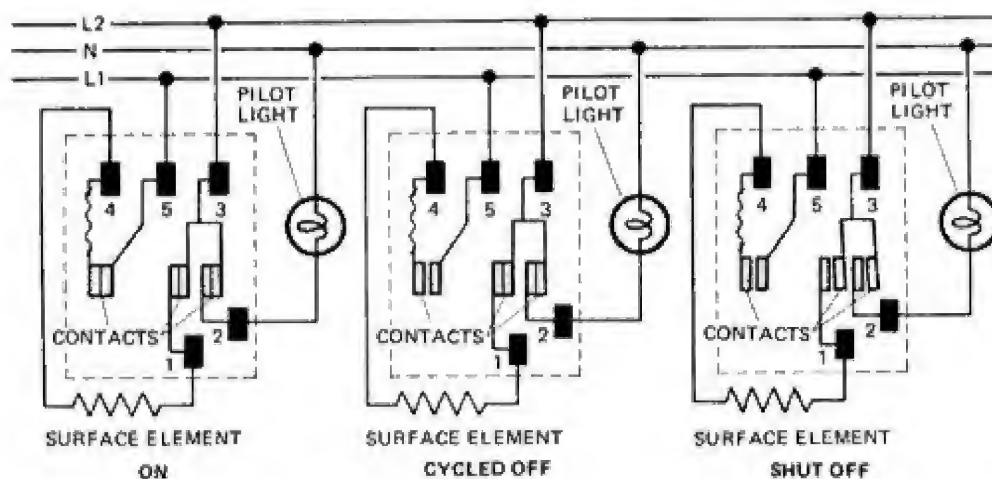
and the infinite-heat switch. The step type is a rotary or pushbutton switch that provides a choice of from five to seven different heats (wattages) by connecting the resistances in the surface element in parallel, in series, or singly to either 230-v. or 115-v. current. Typical wattages for a seven-heat switch could be 212, 287, 500, 850, 1150, 2000 and 3000. Operation of a seven-heat switch is shown schematically on this page.

The infinite-heat switch, which provides a continuous range of settings between "high" and "off," uses an internal bimetal strip, which is anchored at one end and has a switch contact at the other end. As current

(Please turn to page 146)

Oven does not shut off

| POSSIBLE CAUSES | WHAT TO TRY |
|-------------------------------|---|
| 1. Thermostat defective. | Disconnect power, pull bake element (see first chart) and set thermostat in "off" position; reconnect power and check voltage across element terminals. If 230 v. is present, replace thermostat. |
| 2. Automatic timer defective. | Set timer on "automatic," turn clock by hand until it clicks to the "off" position; there should now be no voltage to the thermostat. If there is voltage present, repair or replace the timer. |



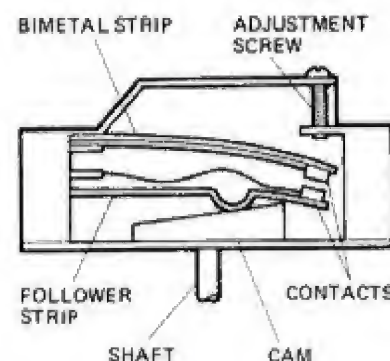
Timer does not operate properly

| POSSIBLE CAUSES | WHAT TO TRY |
|------------------------------------|--|
| 1. Timer set incorrectly. | Refer to the manufacturer's instructions for correct settings. |
| 2. Loose connection. | Disconnect power, tighten all loose connections, then reconnect power. |
| 3. Motor defective. | Disconnect power, remove timer motor and test it directly with 115-v. power. If drive gear does not turn, replace the motor. |
| 4. Blown fuse. | Inspect 15-amp. fuse behind control panel; replace if blown. If new fuse blows, disconnect power and check timer for shorts (see clock-timer discussion, page 149). |
| 5. Gears worn, stripped or broken. | Inspect clock gears in timer; if any are visibly worn, broken or stripped, repair or replace timer. If gears are jammed, try to free them with silicone spray or a TV-tuner cleaner. |
| 6. Contacts defective. | Make voltage checks on timer as explained on page 149. |

Surface unit does not heat

| POSSIBLE CAUSES | WHAT TO TRY |
|-----------------------------------|---|
| 1. Fuse blown or circuit breaker. | Replace fuse or reset circuit breaker. If blowing or tripping is repeated, disconnect the power and check for shorts. |
| 2. Connection loose or shorted. | Disconnect power, tighten any loose connections and replace any charred wiring, reconnect power. |
| 3. Switch defective. | Place voltmeter across switch's input terminals (usually labeled L1 and L2); reading should be 230 v. Turn switch on and place voltmeter across output terminals (to surface element); reading should be 230 v. Replace switch if you do not get these readings. |
| 4. Terminal block defective. | Disconnect power. Inspect inside of terminal block. If it is charred or broken, replace it. If it is pitted or dirty, try to clean it with a contact file; replace it if this cannot be done. |
| 5. Surface element defective. | If element is the plug-in type, unplug it and then plug it into one of the sockets into which the element is known to work; if it does not heat there, replace it. If element is the screw-on type, pull it forward, turn switch on and place voltmeter across surface-element terminals; reading should be 230 v. If voltage is present and element does not heat, replace it. Any replacement element must be of same size and wattage as the original and have the same type of terminals. |

Infinite-heat switch



ELECTRIC RANGE

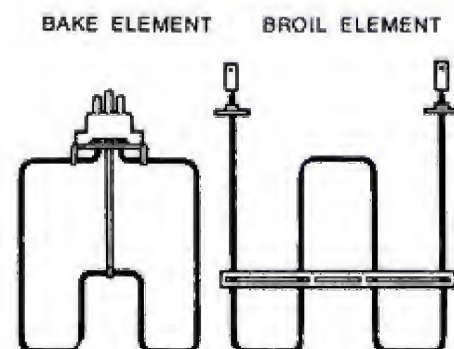
(Continued from page 145)

contact at the other. As current passes through the bimetal and heats it, it curls up and away from the cam-follower strip that carries the switch's other contact. The position of the cam determines how long the element will be on before the bending bimetal breaks contact and cycles the element off. In its extreme position—the "high" setting—the cam holds the contacts together without cycling; in other positions, it controls heat output by governing the time that current flows to the element.

Like surface switches, oven controls vary from manufacturer to manufacturer and model to model. Some ovens have only a thermostat, while others also have a selector switch and automatic clock. The selector switch is used where a range has more than one oven or there is more than one function for the thermostat to perform, or it can determine which oven elements are supplied with current and whether they are connected in series or in parallel.

The thermostat that regulates oven temperature has a fluid-filled sensing bulb, similar to the bulb at the end of a thermometer, suspended within the oven. Expansion of the fluid with increasing temperature activates a bellows in the thermostat that forces contacts apart, cutting off current to oven elements and cycling the oven off; reduced oven tempera-

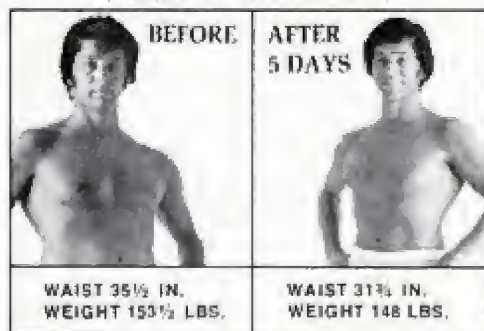
(Please turn to page 147)



"DON'T TELL ME YOU CAN'T LOSE LBS. AND INCHES IN 5 DAYS!"

"I lost 3¾ inches off my waist, 5½ pounds...and shaped up...IN ONLY 5 DAYS!" Richard Moss

(PHOTOS CERTIFIED UNRETouched)



NO RIGID DIETING... NO COMPLICATED EXERCISES

Using this ingenious "5" Minute Total Body Shaper Plan for just 14 days has you starting to lose inches and pounds, adding muscle and vigor. Use it in the privacy of your own home. It has been used by athletes, businessmen... anyone wanting that muscular, athletic look fast. It's safe... Medically Approved... and Guaranteed!

Here are 6 reasons why this amazing plan can have you muscling and shaping up like Richard and.... look years slimmer... in 14 days.

1. It concentrates its trimming action on your fatty areas, particularly around the waist, that gives you that tired aging look. At the same time, it builds up your shoulders, chest, giving you that athletic look, because it works most your body muscles at one time—not body part by body part—the Plan stimulates faster trimming action to help you start shaping up to a more youthful athletic body in 14 days.
2. Simple to use. No undressing. Attach it to any door knob, stretch out comfortably on the floor. Do one "5" Minute continuous rhythmic, enjoyable exercise, twice daily, whenever you have the time, even while watching T.V.
3. Designed to Trim Fatty Problem Areas. Choose from 4 different "5" Minute exercises, each created to help trim down the problem fatty deposit areas of your body in just 14 days.
4. No Rigid Dieting. We suggest you temporarily eat 20% less until you reach your normal weight, without giving up any of the foods you love — eat Ice Cream, Cakes, Pasta, whatever! (It's all in the guide.)
5. Safer and Saves Time. No more running to gyms for complicated, exhausting workouts that can strain you. This simple effective Plan, that you do at home... at your office... anywhere... leaves you refreshed.
6. Weighs only 10 Ounces. Fits any wallet size case. Stores anywhere. Travels with you so you never have to miss a trimming session. Remember, it's the daily sessions that trim you down, add muscle and keep you looking lean and strong.

IT'S FUN WITH RESULTS... "5" MINUTES AND OUT. The Secret Why It Beats Fasting Alone, Making Your Figure Look Years Younger. Fasting programs, when causing weight loss, unlike our plan usually burn off more active tissue (muscles) which can cause your skin to wrinkle, muscles to sag and create dragging fatigue. Our Plan increases active tissue growth — through the use of the "5" Minute exerciser — while concentrating greater fat loss by (exercise and temporary 20% food reduction) making you look years younger as you slim and trim. Within the first "5" minutes you use the exerciser, you start burning off fat, speeding up your metabolism to help burn up stored calories, releasing excess water. Helps curb your appetite without suppressants. Increases energy and well being. It's so simple and enjoyable a Plan to use. Pat. 3,856,874, © Joe Weider 1973



RICHARD MOSS TELLS US... Case #R-439

"I thought it would take weeks instead of days to trim down. I actually lost pounds and inches in 5 days without rigid dieting or complicated exercises. I can't imagine anything faster and simpler than the '5' Minute Body Shaper."

We guarantee you can stay with it remaining trim where you should and adding muscle where you need it—without regaining those inches and pounds. It can put an end to your "gain-and-weight-loss-cycle."

USE OUR "5" MINUTE TOTAL BODY SHAPER PLAN FOR 14 DAYS AND WE GUARANTEE YOU THESE RESULTS:

"You Will Lose Inches and Pounds. Improve Your Vitality, Energy, Fitness, Posture, Work Off Body Tensions, Feel and Look Better and Younger — All To Your Satisfaction Within 14 Days — Or Your \$9.95 Will Be Refunded."

Here's a sampling of what the customers who have shaped up on our Plan tell us happened to them while using the Plan: "I lost 25 pounds, 5½ inches off my waist in 14 days," G. C. "Lost 32 pounds, 6¾ inches off my waist in 21 days," M. F. "I lost 7 pounds and 5½ inches off my waistline in 9 days," L. S.

They were measured by experts before and after. The results verified, some notarized. Your results may vary depending on how overweight you are and how much time you devote to the exerciser. The customers quoted spent 5 to 10 minutes, twice daily and reduced their food intake — temporarily — by about 20%, but none gave up the foods they like.

EXPERTS AND CUSTOMERS AGREE:

It's the no-nonsense way to shape up fast!

START SHAPING UP NOW!

It's America's Most Successful Body Slimmer and Shaper. 600,000 customers have purchased our "5" Minute Plan to slim down — shape-up to build an athletic body fast. Results are proven and notarized. Our guarantee to you is in writing. Experts agree our plan works and works fast. Now, can you think of any reason for not ordering your "5" Minute Body Shaper Plan and start slimming where you should be slim, shaping up where you should be muscular? For a more athletic looking body start today.

SATISFACTION GUARANTEED!

See what our "5" Minute Total Body Shaper Plan can do for you in 14 days. If it does not start shaping you up... adding muscle to your body, return it within 14 days — in good condition — for your \$9.95 refund.

Weights only 10 ounces.



JOE WEIDER Dept. BR/D
"5" MINUTE BODY SHAPER PLAN
Trainer of Champions since 1936
21100 Erwin Street
Woodland Hills, California 91364

Dear Joe: I want to lose inches and pounds. Your promise that I will look leaner and more muscular in just 14 days interests me. Please rush my "5" Minute Exerciser and Illustrated Guide.

I am enclosing \$9.95 plus \$1.00 (for shipping and handling). Calif. res. add 6% sales tax.
☐ Check, ☐ Money Order, ☐ Cash, \$.....
Please allow 3 to 4 weeks delivery.

Name Age.....
Address.....
City.....
State..... Zip.....

RESULTS THAT STAY

"3 months later, I'm firmer, slimmer and stronger than I was years ago. Finally broke the 'loss-and-weight-gain-cycle'."

IN CANADA: 5 Minute Body Shaper, 2875 Bates Road, Montreal, Quebec.

IN ENGLAND: "5" Minute Body Shaper, Craven House, 99A Park Lane, London W1Y-3TA

IN AUSTRALIA: 5 Minute Body Shaper, Riley McKay Pty. Ltd., P.O. Box 417, Manly, NSW 2095

Oven door drops down or pops open

| POSSIBLE CAUSES | WHAT TO TRY |
|-----------------------------|---|
| 1. Door out of alignment. | Loosen door-hinge screws, realign door and retighten screws. Check to make sure range is level. |
| 2. Hinge pin worn or loose. | Disassemble door, inspect hinge pins, replace them if worn or broken—an 8d nail can sometimes be used. |
| 3. Hinge worn. | Hinge worn: replace hinge if edges are worn. |
| 4. Spring broken. | Open door slightly. If it fails to spring closed or drops easily, a broken spring is likely. Inspect springs; if one is broken, replace both. |
| 5. Roller bearing broken. | If door is hard to open or close, a bearing is broken. Replace both. |

Oven drips water or sweats

| POSSIBLE CAUSES | WHAT TO TRY |
|-------------------------------|---|
| 1. Oven preheated improperly. | Preheat oven with door open at first stop. |
| 2. Oven temperature too high. | Use an accurate mercury thermometer to check on calibration of oven thermostat. |
| 3. Door not sealing. | Check door alignment and condition of the door gaskets; realign door if necessary (see chart, "Oven temperatures are uneven," page 145). Replace any worn, cracked or flat gaskets. |
| 4. Oven vent clogged. | Inspect oven vents for obstructions and clear them. If the oven uses a filter clean or replace it. |

Oven lamp does not light

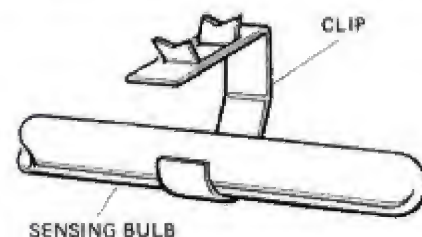
| POSSIBLE CAUSES | WHAT TO TRY |
|-----------------------------|--|
| 1. Bulb loose or defective. | Tighten bulb in socket. If it still does not work, replace it with a new <i>appliance</i> bulb. |
| 2. Switch defective. | Disconnect power, disconnect both leads to switch, place a continuity tester across both switch leads and turn on the switch. There should be a reading of continuity. Turn the switch off. There should be no reading. Replace the switch if you do not get correct readings. |
| 3. Bad contact in socket. | Disconnect power and remove bulb from socket. With finger or blade of a small screwdriver, bend the center socket contact outward a fraction of an inch. Replace bulb and reconnect power. |

ELECTRIC RANGE

(Continued from page 146)

ture and contraction of fluid bring the contacts together again, cycling the oven back on. The thermostat's control knob varies tension between contacts, making it easier or harder for the bellows to force them apart.

Thermostat calibration can be checked by putting a mercury (not bimetal) thermometer in the oven and setting the thermostat at 400° F. Let the oven cycle three or four times, then check the temperature; if it is more than 15° F. above or below the thermostat setting, the thermo-

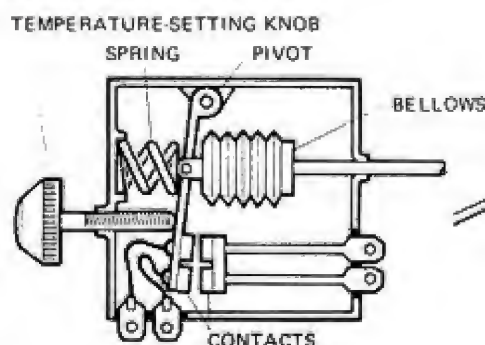


stat requires recalibration. Calibration instructions are usually stamped on the thermostat, but if none can be found, assume that a quarter turn equals 25° F. Turn the calibration screw in either direction, then observe the result. Check calibration annually, more often if the oven gets unusually heavy use. (A source of calibration thermometers for \$7.50 postpaid is Charles Connolly Distributing Co., 41 River Rd., North Arlington, N.J. 07032.)

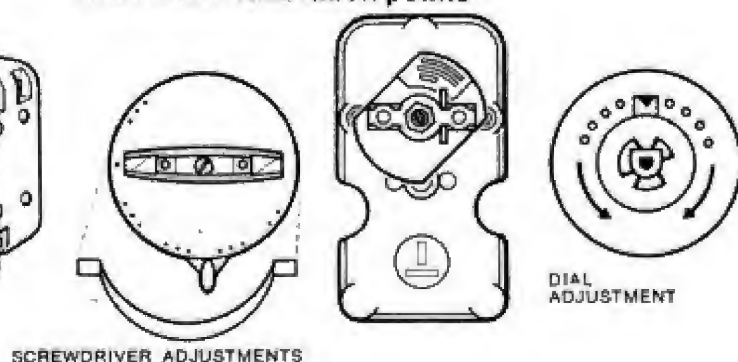
Construction of oven elements is similar to that of surface elements. The broil element usually has two resistances, with a maximum of 3000 w; the bake element is a single resistance rated at about 2500 w. Elements are fastened to the oven's rear wall, but can usually be lowered or lifted slightly to permit cleaning around them.

A range clock may be fully automatic or nothing more than a clock with a buzzer timer. The fully automatic timer is connected to oven controls; timer tests are described on the next page.

Thermostat components



Thermostat calibration points



Electric self-cleaning ovens use temperatures of 850° to 1000° F. to decompose oven soil. The process, called pyrolysis, leaves only a loose ash that is easily removed. The self-cleaning oven has more insulation, heavier body metal, larger and more durable controls and a number of safety features not needed on the ordinary oven.

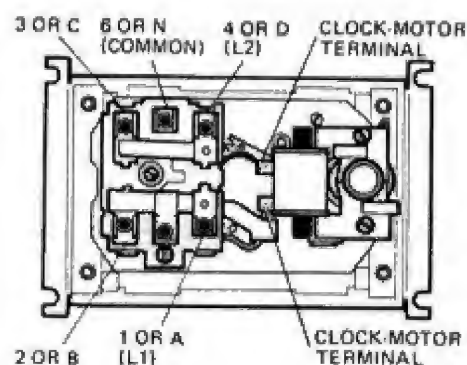
The cleaning cycle uses the oven thermostat, a bias circuit and door-locking circuit. The bias circuit lets the thermostat run in the higher temperature range required for pyrolysis. The door-locking circuit assures positive locking of the oven door at temperatures over 550° F. and keeps the cleaning cycle from starting if the door is not locked; this circuit is essential for safety, as an inrush of air mixing with carbonized soil at high temperature could cause an explosion.

The self-cleaning cycle also involves a cooling fan that circulates air in and around the oven liner and, usually, a smoke eliminator, a device that promotes the decomposition of smoke the same way the catalytic converter in a 1975 car's exhaust system promotes complete combustion of exhaust gases.

Setup sequence for cleaning and duration of cleaning vary among manufacturers, with some offering a choice of cleaning periods. The appearance of the soil remaining at the end of a cleaning cycle indicates cleaning effectiveness. If it is brown and soft, no cleaning has taken place; if it is dark brown, cleaning has been incomplete. Loose gray ash indicates complete cleaning.

Continuous-cleaning ovens require none of the extra circuits and safety devices self-cleaning ovens do. They differ from ordinary noncleaning ovens only in the porcelain with which they are lined. This is somewhat porous, and allows fat spatters to spread out and then decompose at normal cooking temperatures. ★★

Testing automatic timers: Motor: voltage across terminals 1 and 6 should be 115; if not, check for blown 15-amp. fuse behind panel; if fuse is good, see whether motor drive wheel is turning; if not, replace motor. Switch: voltage across 1 and 4 should be 230, as across 2 and 3 with timer set on manual and when timer has turned oven on in automatic operation. If these voltage readings are not obtained, the timer must be repaired or replaced.



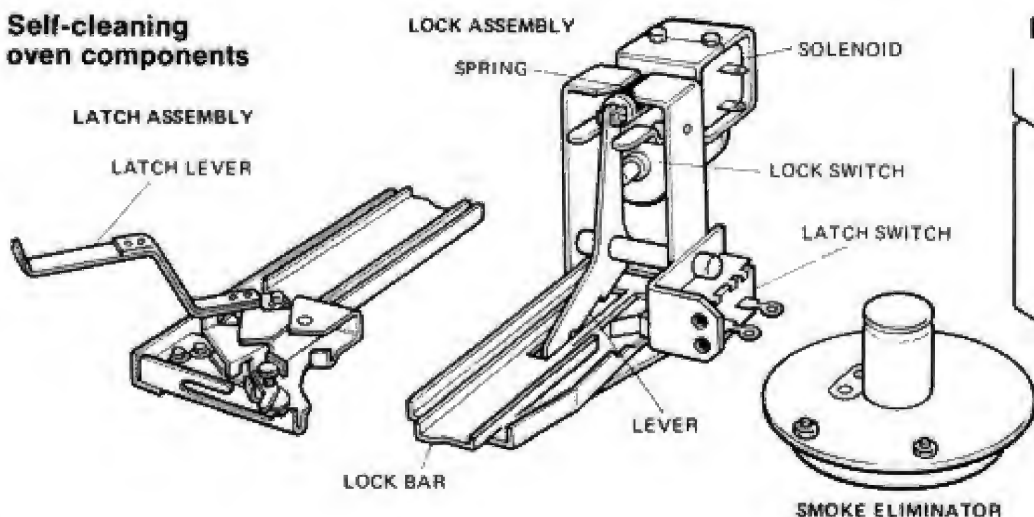
No heat for cleaning (self-cleaning ovens)

| POSSIBLE CAUSES | WHAT TO TRY |
|---|---|
| 1. Controls set improperly. | Refer to manufacturer's instructions for setting controls for cleaning cycle; after setting controls, wait a minute to determine whether they are working. |
| 2. Fuse blown or circuit breaker tripped. | Replace fuse or reset circuit breaker; if blowing or tripping is repeated, disconnect the power, check for shorts. |
| 3. Thermostat defective. | See chart "Oven does not heat" (page 144). |
| 4. Door unlocked. | Inspect door for firm seat against oven, make sure latch is all the way over in locked position; if not, check both door and locking mechanism for alignment. |

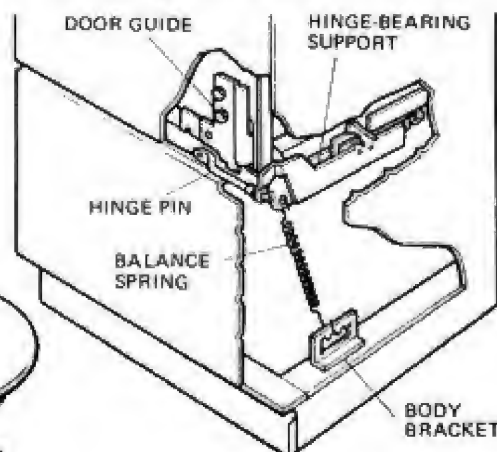
Cleaning is incomplete (self-cleaning ovens)

| POSSIBLE CAUSES | WHAT TO TRY |
|--------------------------------|--|
| 1. Controls set improperly. | See chart above. |
| 2. Cleaning time short. | See maker's instructions on length of cleaning time. |
| 3. Oven elements defective. | See chart "Oven does not heat" (page 144). |
| 4. Line voltage low. | Check voltage at terminal block at rear of range; it should be within 10 percent of 230 v. If it is lower than 207 v., call local power company. |
| 5. Smoke eliminator defective. | Disconnect power, locate smoke eliminator and disconnect its leads; then place continuity tester across eliminator terminals. Replace eliminator if there is no reading or if there are visible breaks in its mesh screen. |

Self-cleaning oven components



Door-hinge assembly



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ELECTRONIC IGNITION CARE

(Continued from page 110)

coil won't usually show up when you test the electronic ignition system. Hairline breaks widen under heat and can cause a running engine to stop. The engine will start when heat dissipates. If this is happening to you, suspect the pickup coil.

7. Use sparkplugs recommended by your automaker only. In many cases, sparkplug gap is much wider than before, and plugs have been designed with a longer side electrode. Trying to gap any other plug to specification will cause you to bend the side electrode to an extraordinarily wide angle, and lead to operational problems.

GM wants its sparkplugs gapped to either .060 or .080 inch, depending on the engine. Ford wants gap ranges from .034 to .054 inch, while Chrysler's comes in at .035 to .040 inch. AMC's setting is .033 to .037 inch.

8. Sparkplug cables are more delicate than before—they are made of a very pliable, soft material that withstands heat and carries high voltage better. Cables are easily scuffed and cut, so be very careful how you route them in the engine compartment. When removing cables from sparkplugs, it's more important than ever to twist and pull on the boot—not the cable.

9. Use an adapter between the No. 1 sparkplug and No. 1 sparkplug cable, and connect a timing light to the adapter when testing ignition timing. Do not pierce the sparkplug cable. High voltage will escape from the break in the cable to the nearest ground, resulting in misfire.

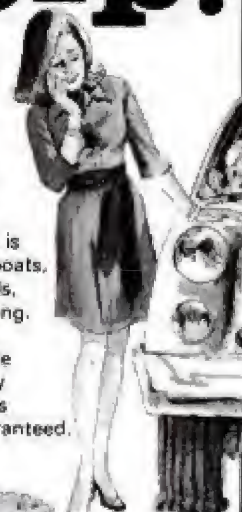
The only auto manufacturer making an electronic ignition system kit to replace the conventional ignition system in its cars is Chrysler. The kit contains a new distributor, electronic control unit, dual ballast resistor and wiring. You use the same ignition coil.

Kits for six-cylinder engines cost about \$75; for eight-cylinder engines, about \$70. They come with complete instructions.

The biggest problem when installing one of these kits is getting the distributor into the engine so splines mesh properly. Before removing the old distributor, set the rotor at top dead center and mark the direction the rotor is facing. The distributor is close enough to the firewall or fender so you can do this by placing a long, sharp-pointed tool along the rotor, and scribing a mark on the firewall. Pull out the distributor and install the electronic ignition unit so its rotor lines up perfectly with the scribed mark. ★ ★ ★

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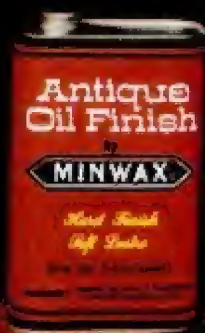
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PM PICKS THE TOP 20 LURES

(Continued from page 63)

pike. Let it sit awhile before the retrieve—then brace for an explosion.

The spoon group

No collection would be complete without these two fine spoons. They compete with other lures under normal conditions and also perform special services that the others can't match.

■ **Dardevle:** Easily the most famous of fishing spoons, this old standby is made by the Lou J. Eppinger Co. of Dearborn, Mich. The red and white standard Dardevle, designed for muskie, pike and walleye, is a northwoods must. A fine casting lure, its tantalizing slow wobble makes it an ideal trolling lure also. But if we had to choose just one spoon, the Eppinger Copy Cat would have to be it. This hump-backed Dardevle operates at higher speeds, takes snook, tarpon, trout, bass and other fish as readily as pike and walleye. (Buck prefers the $\frac{3}{4}$ ounce, and is never without a half dozen.)

■ **Silver Minnow:** As for weeds, this is the lure. Made by the Louis Johnson Co. of Highland Park, Ill., it started the story about the angler who made lures from his wife's teaspoons. Fish this streamlined silver spoon with a pork rind strip as far back in the brush as you can heave it. It's deadly for southern bass, pike, muskie or any game fish in heavy cover; add an eight-inch worm for deep water.

Deep and slow

Most lunkers are lazy. They let small energetic fish chase faster prey and wait for easy meals to pass

their lairs. For them you need deep-running, wobbling lures.

■ **Flatfish:** This gang-hook creation, developed by the Helin Tackle Co. of Detroit in 1933, has been a favorite ever since. Its wobbling action cuts an eight-inch swath through the water and drives deep walleyes wild. Most people don't know the Flatfish is the most popular trout lure in South America. Called a "caiman" there, it annually takes more giant Andes trout than all other lures or flies combined. For trolling, not casting, it's fished with the line tied to the lure and a weight a foot ahead. A favorite is the U-20 in orange.

■ **Lazy Ike:** Extremely versatile underwater, the Lazy Ike was developed by Kautsky Sporting Goods in the early '40s and is now made by Lazy Ike Corp., Fort Dodge, Iowa. This



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lure takes everything. We troll it for deep bass in winter and spring, and it's a first choice for northern smallmouth and walleye. Try it for open-water pike and muskie, through a stream riffle for smallmouth or big trout. Fishing the Amazon, a friend trailed one beside our dugout canoe and took a wild six-foot surubi catfish. Tops for trolling, you can also cast floater models back into the shallows.

■ **Bomber:** This is the original "crank bait." Made by Bomber Bait Co., Gainesville, Tex., it has been dredging bottoms of southern impoundments for over 25 years and catching lots of bass. Fish sloping banks with floaters, deeper points with others. To bring 'em out of the deep, add a slip sinker up front. Although a largemouth lure, the Bomb-

er is also excellent for walleye, smallmouth, muskie, pike off deep points, big trout and more. All the many colors and finishes take fish.

Big and deadly

■ **Rapala:** A slim-bodied Finnish creation distributed in North America by the Normark Corp. of Minneapolis, it's one of the great all-time fishing lures. When this balsa import appeared on the U.S. scene in 1962, it created a revolution. Bass, muskie, pike, trout, walleye, panfish all fell for it. Fishermen bought out the complete stocks of tackle shops and caught fish with wild abandon. Today the furor is over, but the Rapala in eight models and dozens of colors remains a great one. Several should be in your tackle box.

■ **Rebel:** Topnotch U.S. contender for honors the Rapala debut started, this fine one from Plastic Research & Development Corp., Fort Smith, Ark., is durable and deadly. Work floating models like surface lures or retrieve just under the surface. Sinkers and deep runners are equally effective. On one lake, Rebel took more trout one season than all other lures combined. Another time it proved most deadly of all peacock bass lures. Use it for bass, pike, muskie, all game fish—it's great.

■ **Big O:** When a hand-carved balsa model of this fat plug won a bass tournament a couple years ago, it became the hottest of lures and earned its place on this elite PM list. Manufactured by Cordell Tackle Co., Hot Springs, Ark., it now comes in four sizes, many colors. In Ontario we've had smallmouth bass eat it up, but also once caught more muskies on this fatso than on a dozen previous trips. And in the Amazon

(Please turn to page 153)

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jungle, big dorado and peacock bass tear into our Big O. It's a winner.

The fast ones

Sometimes fish pass up old favorites, yawn at worms and jigs. Occasionally it takes a fast lure to trigger these lethargic ones into action.

■ **Sonar:** This glittering metallic mover made by James Heddon's Sons of Dowagiac, Mich., is a forward-weighted lure with a fast sound-producing wiggle that casts like a lead weight and can be fished at almost any depth. Each of three holes for the line produces a different action that's great for largemouth and stream-bred smallmouth alike. Smaller Sonars are hot for trout, and ever since this lure was introduced there have been dozens of imitations. None, though, have surpassed it.

■ **Mirrolure:** "Best jerk bait ever made," is how veteran snook fishermen describe this one from the L & S Bait Co. of Bradley, Ill. For a fast-moving lure for fresh or saltwater, this shiny sardine brings out the worst in game fish. Some strike it from hunger; others for spite when you give it little jerks with your rod and it darts like frightened bait. Choose from many colors and finishes for all inshore saltwater species, schooling bass, fast water trout.

Spinning lures

They do these well in Europe; one of these spinner favorites comes from Sweden, the other from France. Both rate top tackle-box billing.

■ **Abu Reflex Spinner:** Made by Abu of Sweden and distributed by Garcia of Teaneck, N. J., this one comes from two of the quality names in the business, and performs like it. A favorite for big Irish pike and Norwegian salmon, it also took a 17-pound brown trout recently to win the Abu G.B. International Contest. Over here it takes all types of trout, is effective for pike and largemouth, has a wide range of casting and spinning sizes, blade and body colors.

■ **Mepps Spinner:** When spinning was introduced here in the 1940s, this French spinning lure came along. Today, distributed by Sheldon's, Inc. of Antigo, Wis., it's known coast to coast as one of the finest trout lures. It's used as well for far north grayling, white water walleye, white bass, crappie, black bass, you name it. Keep the blade wet and moving.

Bottom bumpers

"If they're not on top, they're on the bottom," is the old adage; this lure group goes down and gets 'em.

■ **Doll Fly:** One of the world's best

known jigs, this teaser from the Zebco Doll Div. of the Brunswick Corp., Tulsa, Okla., will take bass off the bottom of impoundments or haul snapper up from southern seas. Use it for lake trout, salmon, walleye, crappie. Fish it slow or crank as fast as you can through schooling, feeding gamesters. You can cast the jig a country mile with any rig. It gets to the bottom fast, and you can bump it along with minimum risk of snagging. Doll Fly comes in many sizes: yellow and white are favorite colors.

■ **Jig-A-Doo:** Made by Burke Flexo-Products Co., Traverse City, Mich. this little tantalizer is a cross between a jig and an underwater action lure. Its plastic lip gives it a wiggle that needs no help from the angler.

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A trailer hook attached to the main hook makes it even more effective in nailing short strikes. Considered among the best lures for walleye and smallmouth. One once was taken away from the bass we were fishing for by three muskies. It works on the bonefish flats, murders surf-feeding snook, and is equally effective for tarpon. If there's a lure which can do almost everything, this little Jig-A-Doo might be it.

■ **Lil' George:** This heavy little spinner, made by Mann's Bait Co., Eufaula, Ala., is relatively new compared to most of our other selections, but has already made quite a name for itself among professional bass fishermen. It casts like a sinker, hits bottom faster than you can catch your breath and frequently induces strikes on the way down. You can jig it, bounce it down a rocky ledge, buzz it past a brush pile, work it in a swift current which will ruin the action of most other lures. It's a great bass lure that is also equally effective for walleye and white bass. Last year we fed some to northern pike and created a mild revolution in a certain northwoods fishing lodge. A few months ago we introduced Lil' George to half a dozen species of South American fish and again it was love at first sight. When things are tough, you're still not whipped. Send Lil' George. ★★

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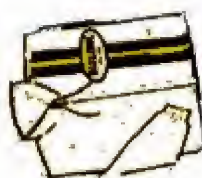
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HOMEBUILT TOW GLIDER

(Continued from page 88)

struction and control simple. There are no rudder pedals to bother with because there's no rudder. The vertical stabilizer is fixed. There also are no elevator panels as such. The entire tail, mounted on the end of a boom, swings up and down on a single pivot to serve as an elevator for climbing and diving.

The ailerons are unique, too. Since there's no way to notch them into the flexible wings, they're actually mounted above the wings, hinged to the leading-edge spars out at the tips. Unlike conventional ailerons, they work on a "drag" principle. As you raise the aileron on the right wing, air resistance slows the wing on that side, swinging the ship into a right-hand bank. Raising the left aileron banks you to the left in the same manner. In this system, there is no "adverse yaw" effect and thus no need for a movable rudder as in conventional aircraft.

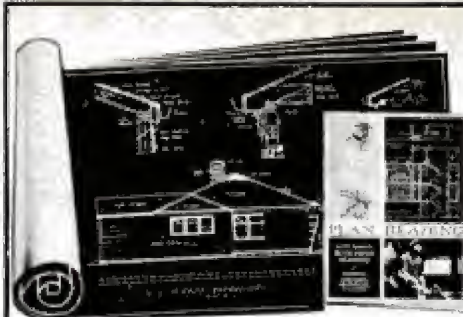
A single joystick is your only control. You move it backward to climb, forward to dive and side-to-side to steer. Virtually any speedboat powerful enough to pull water skiers can tow the glider. You need a speed of 20 to 25 mph for lift-off and 30 to 40 mph for cruising. Your towline can vary in length from 100 to 200 feet or more. The longer the line, the more freedom you will have for maneuvering independently of the towboat.

As with flying any aircraft, there are some cautions. The first and most critical is never—repeat never—attempt downwind landings or takeoffs. Always land and take off into the wind. The reason is to gain maximum lift at low speeds, assure good stability and control and eliminate any danger of stalling. Tom warned me about the importance of this, but I forgot about it in my excitement on one flight.

We were heading downwind and I decided to come in for a landing. That was a mistake. As my forward speed slowed, the following wind canceled out lift on the wings and I was in a stall. I yanked frantically back on the stick to try to hold her up, but it was too late. She plopped into the water with a shuddering smack and dug a wingtip into a wave. I could see Tom wince.

The towline is attached to the glider's nose by a quick-release catch with a trip lanyard leading into the cockpit. This is a safety measure. While you're not likely to need it, it's a good idea to keep one hand on

(Please turn to page 156)



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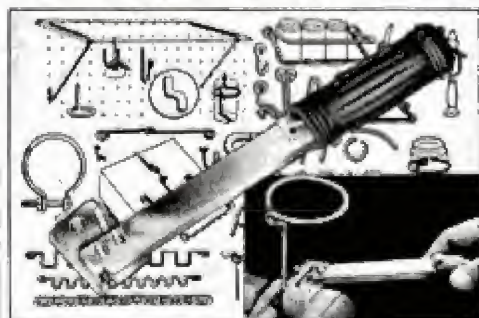
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HOMEBUILT TOW GLIDER

(Continued from page 154)

the lanyard at all times, while operating the control stick with your other hand. Should you encounter any situation where you find yourself getting out of control—such as a severe, sudden yaw or roll—immediately yank the release and cut loose. Without the pull of the boat, the ship will straighten out naturally and glide in for a safe landing. Remember, though, this is strictly an emergency procedure. Legally, you're required to remain in tow.

While I can truthfully report the Sea Sprite is easy to fly, I wouldn't recommend that anyone without flying knowledge just hop in and take off. It's wise to familiarize yourself with the basics of flying first. Many good pilot-instruction manuals are sold in bookstores. Read one. And when you try your first flight, start off easily and carefully. Practice takeoffs and landings a few feet off the water to get the feel of the craft. As you gain experience, you can progress to longer and higher flights. Don't try banking turns close to the water. That 34-foot wing-spread is longer than it looks and could catch on the surface if you're too low. Stay within a reasonable altitude. I found 50 to 60 feet about maximum for safe, comfortable flight.

Good coordination between tow-boat and glider pilot is an absolute must. As in water skiing, it's essential to have an observer in the boat along with the driver. Work out a system of hand signals so you and your observer can communicate.

In building the craft, use only materials specified in the plans. Tubing must be of aircraft-grade quality. And while the polyethylene skin is tough, care must be taken to reinforce it against tears. For this reason, the wings are crisscrossed with strips of high-strength glass-cloth tape to act as rip stops. If a rip should start, it can't travel more than a few inches. Thus there's no danger of losing a wing in flight by having the plastic tear off.

Plans for building the Sea Sprite are \$14 from Thomas H. Purcell Jr., Flight Dynamics, Inc., Box 5070, State College Station, Raleigh, N.C. 27607. (NOTE: Because we have no control over the manner in which the Sea Sprite is built and flown, Popular Mechanics disclaims all responsibility for the quality, condition, design, workmanship, and materials of the glider built from these plans, and for its proper and safe functioning in use.)

We found a bed long enough for Too Tall Jones.



Introducing Datsun's 7 ft. Li'l Hustler Stretch.

Now you have a choice of two Datsun Pickups: one with the standard six foot bed, and this new Li'l Hustler Stretch with the extra long seven foot bed that gives you more room for business, sport and camping.

The football player relaxing on the seven foot bed is Too Tall Jones, 6'9" defensive end of the Dallas Cowboys. There's plenty of room, even for him.

Something else is bigger in this new Datsun Li'l Hustler Stretch. It has a larger more powerful 2000cc overhead cam engine that's easy on gasoline and very dependable, whether you prefer the 4-speed stick shift or the optional 3-speed automatic. Also you get torsion bar front suspension, rugged two-stage rear truck-type suspension and a beefier clutch.

The choice is yours: the six foot or the seven foot all-steel load bed. Either way you get the kind of Datsun over-engineering that keeps your operating costs down and profits up.

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You'll build and work with remarkable educational tools as you explore advances in electronics—"State-of-the-art" equipment that's being used today—and will be used tomorrow. So the skills and knowledge you will acquire will be useful for years to come.

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With Bell & Howell's Electro-Lab® electronic training system—theory comes to life. And you'll make it happen! In building each of these modern test instruments you'll get experience in wiring, soldering, assembling. Then you'll use the lab for testing, trouble-shooting and circuit analyzing.

First, the **design console**. After you assemble it, you'll be able to set up and examine circuits without having to solder them in place.

Next, you'll build a **digital multimeter**. This important instrument measures voltage, current and resistance, and displays its findings in big, clear numbers like on a digital clock.

Then comes the **solid-state "triggered sweep" oscilloscope** similar in principle to the kind used in hospitals to monitor heartbeats.

You'll use it to analyze tiny integrated circuits. The triggered sweep feature locks in signals for easier observation.

You'll actually build and work with the new generation color TV...investigating features you've probably never seen before!

This 25" diagonal color TV has digital features that are likely to appear on all TV's of the future. Features made possible by the applications of digital electronics to home entertainment.

You'll probe into the technology behind all-electronic tuning. And into the digital circuitry of channel numbers that appear on the screen! You'll build-in an on-the-screen digital clock and learn to program a special automatic channel selector that

goes directly to the channels of your choice.

You'll also better understand the exceptional color clarity of the Black Matrix picture tube, and gain working knowledge of "state-of-the-art" integrated circuitry and the 100% solid-state chassis.

After building and experimenting with this TV, you'll be equipped with the kinds of skills that could put you ahead in electronics know-how.

Once you've completed this program, your skills in electronic trouble-shooting could lead you in exciting new directions. While we cannot offer assurance of income opportunities you can use your training: to seek out a job in the electronics industry, to upgrade your current job, or as a foundation for advanced programs in electronics.

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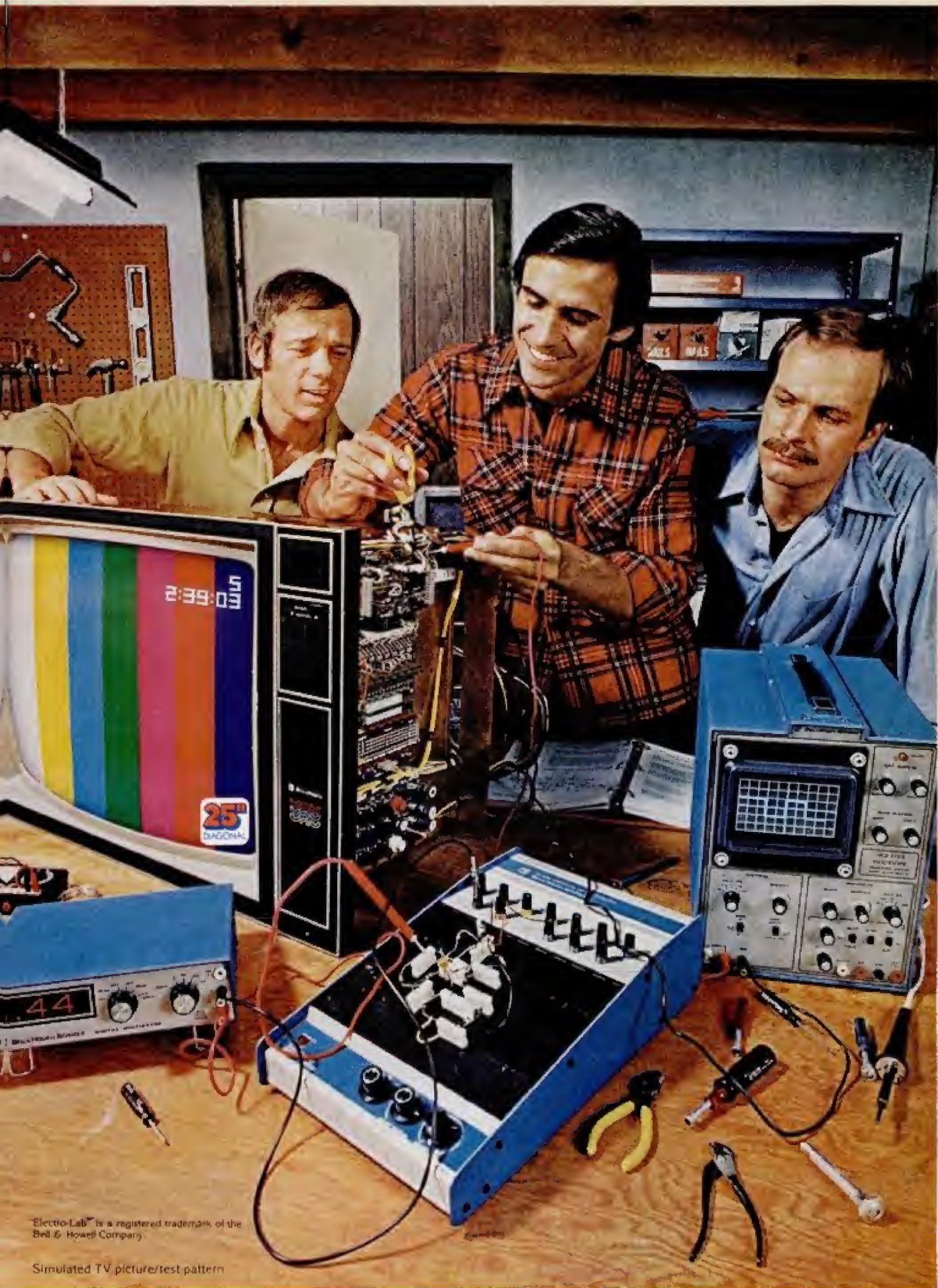
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TOM McCAHILL SAYS:

"The appliance repair field is so uncrowded it's almost lonely!"



Someone once said that if you build a better mousetrap, the world will beat a path to your door. In the home appliance business, a lot of enterprising companies have gotten rich peddling a long list of handy electrical gadgets for the home. The trouble is, the two dozen or more appliances in the average American home can go on the fritz, and men with the proper training to do repairs are as scarce as plumbers on weekends.

Good Appliance Repairmen are a rare breed these days. Those with a little ambition are booked so solidly you can wait days to get somebody to fix a balky refrigerator or cantankerous toaster. Sometimes, you have to settle for a bum job from a guy who had no business calling himself an Appliance Repairman in the first place.

This brings me to my point. If you want to make money in a field that's begging for trained technicians, there's a fine, low-cost home-study plan available that teaches you how to handle every type of Appliance repair in detail—including refrigeration, air conditioners, and even small gas engines. The course was prepared by the instructors at National Radio Institute. This is the oldest and largest home-study school in the Electronics/Electrical fields with more than sixty years' experience training men like yourself for new careers or spare-time or full-time businesses of their own.

A few years ago, NRI recognized the increasing demand for trained Appliance Repairmen. They set about preparing well-illustrated, easy-to-understand lessons that teach you how to repair home, commercial and farm Appliances. NRI even added a professional Appli-

ance Tester that's included in their low tuition. With the Tester and a few basic tools you probably already have, you're equipped to service most Electrical Appliances. If you aren't making \$5 to \$7 an hour in spare time fixing Appliances for friends and neighbors within a few months after enrolling, my name isn't McCahill.

The reason I'm no doubting Thomas, is because the staff at NRI is composed of experienced instructors who guide you through the course with more personal attention than you'd get in many classrooms. With the kind of help they give a student and the kind of course they have, you can be the man in demand in this field—even if you've never rewired a plug, or got fed up with school at the 9th grade.

The best advice I can give you is to clip the coupon below and send for the NRI Appliance Training Catalog. It's free, and there's no obligation. NRI doesn't employ salesmen, so nobody will be knocking at your door. All it will cost you is a postage stamp. Take it from Uncle Tom, the Appliance Repair field needs good men. Now.

Tom McCahill

Tom McCahill

FABULOUS PHONO CARTRIDGES

(Continued from page 88)

ing a different turntable.) These figures should therefore be used only for relative comparisons among the cartridges we tested, not as absolute figures.

Contrary to common belief, the optimum tracking force is not the lowest force at which the stylus stays in the groove. Rather, it is the minimum force at which the stylus can track fairly loud signals without distortion. The lower the figure, the better the cartridge.

Trackability measures how loud a signal, in each of three frequency bands, the cartridge can trace without distortion. The louder the music, the wider the groove and the faster the stylus must move to follow it. Therefore, trackability figures are given in terms of the stylus's speed in centimeters per second (cm/sec.) as it traverses the loudest passage it can track cleanly in the low, middle and high audio ranges. As with our August tests, we used the Shure C/PEK-3 cartridge tester and audio Obstacle Course test records to make these determinations.

Technical measurements give valuable clues to a cartridge's quality, but they can't describe the tonal character it imparts to the music. The proof of this particular pudding lies in the listening. That's why we checked out each cartridge with different types of music: a symphonic score (Tchaikovsky's *Sixth Symphony*, RCA ARD1-0426), vocal music (Joni Mitchell, *Court and Spark*, Asylum EQ1001), and a brass and percussion group (Kurt Weill's *Kleine Dreigroschenmusik*, Nonesuch H91281). After weeks of listening to test signals, this part of the test program was a pleasure. And the results showed one cartridge to be a clear standout, one below par, and the remaining seven to share a very similar—and very satisfactory—level of performance.

The standout was the B&O 6000, which played all types of music with an astounding combination of clarity and warmth of tone—two attributes rarely found together in one cartridge, but the B&O is a splendid exception. Its highs have brilliance without harshness, the bass has real depth and power without tubbiness, the strings are sweet yet transparent, the voices are natural, and the percussion has bite and impact to lift you right out of your chair. The B&O had the second sharpest drop-off in the carrier range, which our Panasonic demodulator

(Please turn to page 164)



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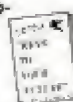
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FABULOUS PHONO CARTRIDGES

(Continued from page 162)

handled with only a slight increase
in noise in CD-4 playback—again not
bothersome, even on CD-4 discs that
had previously been played a few
times by stereo cartridges. But with
other demodulators, it would pay to
test before buying.

At the opposite end of our subjec-
tive rating was the Panasonic. It's
by no means a bad cartridge, but in
comparison with the others it seemed
a bit muddy, with its highs sounding
choked, and its lows lacking richness.
It also had the highest optimum
tracking force of the nine cartridges
we tested. In trackability, though, it
measured better than most at low
and middle frequencies, and about
average at the high end. All in all,
not bad for one of the two cheapest
models in our survey, even if we
liked the sound of the other one (the
Audio-Technica AT12S) better.

The Panasonic, unlike the others,
requires a special d.c. power supply,
(which is built into Panasonic and
Technica demodulators). Since the
Justi-Meter we used to measure fre-
quency response has no such supply,
we were unable to measure the Pana-
sonic's response without building
special adapters.

All the other cartridges sounded re-
markably good. If none quite
matched the remarkable quality of
the B&O, some came close—particu-
larly the Pickering UV-15/2400-Q
—and we also liked Empire's 4000D/
III, which gave an exciting sense of
presence to the brass. We were im-
pressed by the smoothly balanced and
eminently musical sound of both the
Audio-Technica AT20SL and AT15S.
In fact, we could hear no difference
between the two—no great surprise,
considering that the AT20SL is just
an AT15S hand-picked for its per-
formance. In our samples, this showed
up in flatter carrier-range response
and higher low-frequency and mid-
frequency trackability.

As for the Audio-Technica AT12S,
it is a real bargain, differing from
the more expensive models primarily
in being just a little less shiny in its
uppermost highs, but still sounding
sweet, rich and clear. For anyone on
a budget, the AT12S would be a fine
initial choice. For stereo use, the
ADC would be worth the extra \$10;
but with the weakest carrier response
of any cartridge tested, it should be
checked with the demodulator you
plan to use before you buy it.

All cartridges in this group are
designed to work into a 100,000-ohm
input, standard for all CD-4 demodu-

(Please turn to page 166)



Ride the air with push-button shock absorbers.

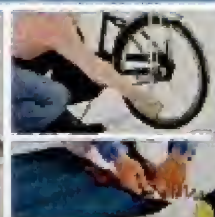
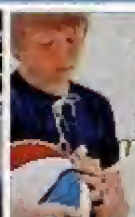


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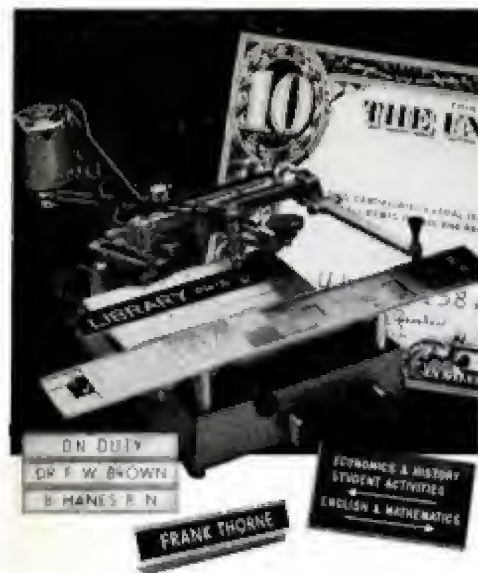
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FABULOUS PHONO CARTRIDGES

(Continued from page 162)

lators, but not for stereo amplifiers, which normally have 47,000-ohm inputs. Since some listeners may want to use these cartridges with stereo equipment, we also tested a sampling of them by playing them through a standard stereo setup. The partial impedance mismatch seemed to have no effect, though a direct A-B comparison might have made some subtle differences audible.

To sum up: Even if you just want good stereo sound, these cartridges (and, presumably, the many new models due on the market later this year) are well worth considering. And if you want to hear four-channel sound from CD-4 Quadradiscs, they're essential. ★ ★ ★

PORTABLE DARKROOMS

(Continued from page 109)

brown type will do for use at night.

If the room has a door, make it light-tight with weatherstripping. If not, cover the open doorway with more plastic, overlapping and taping the bags together. Ventilation can be a problem; my kitchen fan handles the problem for me.

Print drying can be left to the day after your printing session. It won't hurt the prints to soak, though the water should be changed a few times. Squeeze an electric print-dryer into your budget if at all possible—it's the only way to make sure that the prints you've spent hours making will look as good when dry as they did wet. For matte prints, you'll get a far more smoothly finished, wrinkle-free surface than you could with a blotter; and with ferrotype tins, you'll get good glossy prints much faster than you would with plain air drying. The best size for your dryer of ferrotype tins is 16x20 inches. It's big enough to handle big prints and will let you dry four 8x10s at once.

For finishing touches, take the extra steps of spotting and mounting your prints. With just three bottles of spotting tone (in different densities) and a fine brush, you can render many dust spots and other imperfections invisible. For print-mounting, your best bet is to use one of the special adhesives sold in photo stores. Electric dry-mounting presses are bulky and expensive, and though a few hobbyists dry-mount successfully with a clothes iron, there's risk of damage to the print.

Useful mounting tools include a wallboard knife, a steel straightedge for trimming and a board with a weight on top to press the paper down for a blemish-free surface. ★ ★ ★

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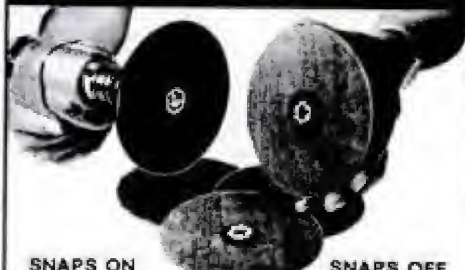
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'75 IMPORTED CARS

(Continued from page 73)

combustion chamber and fires the rich mixture, which in turn fires the lean mixture in the normal combustion chamber. Result: normal power and drastically reduced combustion by-products.

The standard Civic for 1975 uses the previous 1200-cc engine and is, to all intents, identical to 1974 models. The CVCC, though, uses a 1500-cc powerplant and is three inches longer plus about 100 pounds heavier. Both drive the front wheels. There's a wagon coming, too.

Jaguar. The exciting Jaguar line continues into 1975 with refinements on the Six and V12 models.

Jensen. The Interceptor and Jensen-Healey models are virtually unchanged. Unchanged, too, in its incredible economy is the dohc, two-liter used in the roadster.

Lamborghini. Three Lambos are new to U.S. roads. They're terribly exotic, so consider yourself lucky if one passes by and you just catch a glimpse of it.

Lancia. The front-wheel-drive Beta sedan and coupe are real road-holders and should turn a lot of heads this spring. The coupe is clearly the most exciting of the new sport models (see pictures, page 71).

Lotus. Star of the Lotus line for '75 is the Elite M50, introduced last spring. A lovely, lithe four-seater, the Elite is unusual in many ways. It has a unitized fiberglass body with steel subframes and a 16-valve, dohc Four. This is the same engine supplied to the Jensen-Healey. A big wiper clears the entire, lightweight glass windshield.

Maserati. For future shock don't miss the new Khamsin.

Mazda has dropped the RX-2 and is now concentrating on the RX-3 and RX-4 rotaries. These and the conventional four-cylinder Series 808 are little changed for 1975. The rotaries keep their 50,000-mile/three-year engine warranty, and Mazda looks forward confidently to passing the stringent 1977 smog standards.

Mercedes-Benz. The five-cylinder diesel, dubbed the 300D, raised some eyebrows when first announced, but despite being the only Five in cardom, M-B assures us it's nothing radical. This engine—its basic design—is very similar to the four-cylinder 240D. M-B engineers figured it this way: "Since the individual cylinder volume of the 240D diesel engine, at 600 cc or 36.6 c.i.d., is considered the maximum for optimum combustion efficiency... the building of a larger four-cylinder engine was ruled out. And an in-line,

six-cylinder diesel was considered too large and heavy because of structural requirements. The solution was the addition of one more cylinder to the 240D engine. The 300D engine is about 68 pounds heavier than the 240D and roughly the same weight as the six-cylinder gasoline engine. It's a happy compromise of economy, performance and low emissions.

MG. The 1975 Midget has a bigger four-cylinder engine, an all-synchro (finally) four-speed transmission and a bumper inspired by British Leyland's ESV (experimental safety vehicle). The bumper's construction stretches polyurethane over a steel core. MGB gets a similar front bumper: We like it; purists will hate it.

Opel. The 1900-cc Opels get fuel injection for 1975. Buick dealers have a solid lineup, but we'd like to see GM bring in the 2100 D diesel sedan to expand the availability of diesel passenger cars in the U.S.

Peugeot. Subtle changes include squarer wheel cutouts and six more horses from gasoline-engined models (now 88 bhp). The power increase comes from upped compression, and this engine doesn't need a catalytic converter. The Peugeot diesel remains virtually unchanged.

Porsche. Not all that much new about Porsche's 25th anniversary models except for a slightly bigger engine in the 911 series (2687 cc vs. 2653 cc last year). Autograph collectors can opt for a limited-edition Silver Anniversary 911S Targa or Coupe fitted with custom interior and a personalized dash plaque.

Renault. All series adopt last year's Gordini crossflow hemihead, and the Gordini itself uses only the larger 1647-cc engine. Horsepower in the 12 and 15 series rises from 63 to 72, and the Gordini now has 89 bhp net. Series are otherwise basically unchanged, the sole major new option being power steering. The successful (in Europe) Renault 5 will be here late in '75 or early '76.

Rolls-Royce. No major change. It's hard to improve such a good thing.

Saab. Advanced engineering here includes front-wheel drive, an ohc slant Four, Bosch fuel injection, monocoque body, live rear axle, coil springs, four-wheel nine-inch disc brakes and a heated driver's seat. Automatic trans is optional, as are power steering and airconditioning.

Saab has three '75 models: the basic 99LE in two and four-door body styles; 99EMS, a sporty two-door with alloy wheels and racing trim; and the WagonBack. The Sonnett sports car has been discontinued.

Subaru. The new two-door hardtop, called Evening Star, is Subaru's

(Please turn to page 174)

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'75 IMPORTED CARS

(Continued from page 172)

sporty model for '75. The unique and utilitarian intro is the Super Star four-wheel-drive station wagon. It's a one-of-a-kind.

Toyota. Extensive facelifts in the Corolla line, a new 2.2-liter engine for the Corona/Celica, plus broader use of the five-speed transmission mark Toyota's 1975 offerings.

The Corolla has revised styling, more head and legroom, bigger gas tanks, and the five-speed o.d. trans available in all models except the base two-door. The 1200-cc engine is no longer offered—just the 1600 cc. The five-speed is standard in the sporty SR-5 hardtop.

Little visible change in the Corona Celica, but the 2.2-liter 20R engine has been redesigned for more power and a purer exhaust. It uses an aluminum crossflow hemihead and an overhead cam. This power unit needs no cat converter except in California. Last year's Electro Sensor Panel (ESP) is continued and is standard in Corona hardtops; optional in other models. This ESP monitors 11 vital service functions.

Triumph. The TR6 and Spitfire are unchanged. For the new TR7, see *Imports and Motorsports, page 28.*

TVR. Unchanged, still handbuilt by 75 Blackpuddians who turn out 450 of these roadable cars annually but this season hope to produce 600.

Volvo. The new 240s have a totally different front suspension, rack-and-pinion steering, plus other refinements. Available body styles in this series are 242 and 242GL two-door sedans, 244 and 244GL four-door, and 245 wagon. GL designates luxury equipment including leather seats, sunroof, tach, heated driver's seat, metallic paint, and a choice of automatic or o.d. transmissions.

The new 240's grille and bumper ensemble were inspired by Volvo's ESV. Its suspension uses McPherson struts up front and redesigned leaves with stabilizer bars around back. Smaller 14-inch radial tires are now standard on the 240s, and the four-wheel disc brakes have been improved. Seats and interiors are entirely new in this year, with see-through headrests.

The 164 series is little changed, but its seats have been redesigned for better vision and adjustability. It remains as Volvo's top offering, with many standard features: airconditioning, automatic or overdrive, power steering and brakes, leather upholstery, heated seat, electronic fuel injection, steel-belted radials, and power front windows. The cars are safer than ever. ★ ★ ★

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BIG PIPE DREAM COMES TRUE!

(Continued from page 77)

candle will keep an igloo warm enough to support life, say these confident, carefree adventurers, but it takes a tough, hardy breed to brave such hardships nonetheless.

Most men work what they call "seven-tens"—seven days a week, 10 hours a day for a 13-week stretch, then get a week off to go home or to a nearby city for some fun—if they're lucky enough to find transportation. That's a rough work schedule. In addition, the use of liquor on the job is forbidden, and there is little opportunity for contact with the opposite sex since there are few lady workers in the Arctic.

There are two compensations: Both the pay and food are spectacular. Weekly checks of \$1000 or more are not uncommon for skilled labor. With overtime, some can net as much as \$60,000 in a year. A typical camp menu frequently includes such luxuries as steak and (not or) lobster. That's living pretty good even if the work is hard.

Two problems that make the pipeline such a difficult engineering feat—aside from battling the fearsome climate—are the delicate tundra and permafrost underlying it. Before work could even start on the supports for the pipe, 6500 crewmen labored through the long, cold Arctic night to lay down a five-foot-thick work pad of gravel 50 feet wide for the entire length of the pipeline run. The purpose of the pad is to protect the fragile tundra from the immense weight of heavy construction machinery.

The pipe itself consists of sections 40 feet long and four feet in diameter. These are being welded together in pairs. These giant 80-footers will then be brought in on the gravel pad—riding pyramid-style, three to a load—on a special three-axled flat-bed trailer. The vast trailer is self-steering through a servomechanism in the tractor cab so the rear end automatically follows the tractor just like the back of a long hook-and-ladder fire engine. The entire unit stretches a colossal 95 feet over the ground. It's just one of many mammoth, ingenious, exotic pieces of equipment that must be rolled in on the gravel pad.

Until the Yukon River bridge is completed later this year, such monsters will cross the half-mile of water on an "ice bridge" engineers build up by pumping layers of water onto the surface until they have a frozen strip 100 feet wide by six or more feet deep—enough to support

the heaviest traffic. Huge hovercraft are also being used to ferry construction equipment across the river.

Ironically, it's the permafrost that gives engineers their greatest headaches. This is a layer of soil underlying the surface tundra that is solidly and permanently frozen. In the north, the permafrost may begin a few inches below the surface and extend to depths of 2000 feet. While such a sturdy base might seem to offer a firm foundation for pipeline supports, just the reverse is true. The problems come when it melts. Oil that flows through the pipe arrives extremely hot from the deep wells—up to 145° F. Even in the intense Arctic cold, heat generated by friction of the moving oil keeps it at a relatively high temperature. The oil will still be at 80° to 90° when it reaches Valdez after traveling nearly 800 miles.

This heat plays havoc with the permafrost. If the pipe were simply buried bare in the ground, its warmth would quickly melt the permafrost, causing the line to shift, sink and ultimately rupture. For this reason, engineers elected to elevate the pipe on tall support columns in areas where underground burial would be impossible. The columns, made of 18-inch cold-temperature steel pipe, average 50 to 60 feet in length, with 36 feet sunk into the permafrost. Pairs of these super pilings will be planted every 60 feet along the route. The pipe will be supported on "floating" shoes sliding sideways on cross members between the columns. The shoes will permit the pipe to move back and forth freely to accommodate any slumping or shifting of the permafrost. In seismic zones where fault activity may produce severe shifting, the pipe can move as much as 19 feet horizontally and 5 feet longitudinally without danger of rupturing.

The pipe will also be laid out in a zigzag pattern along the route to compensate for normal expansion and contraction under the climate's extreme temperature changes. As the metal shrinks, the pipe will stretch out straighter; as it expands, it will sort of accordion-pleat itself into a Z shape to take up the slack.

Such incredible engineering is what makes the pipeline project the remarkable undertaking it is. And that's just part of it. Even with the elevated supports, heat will still be a problem in some areas. Heat transmitted from the pipe down through the columns and into the permafrost could cause melting and sink the supports. In these cases, a special heat-dissipating system is installed in

(Please turn to page 178)

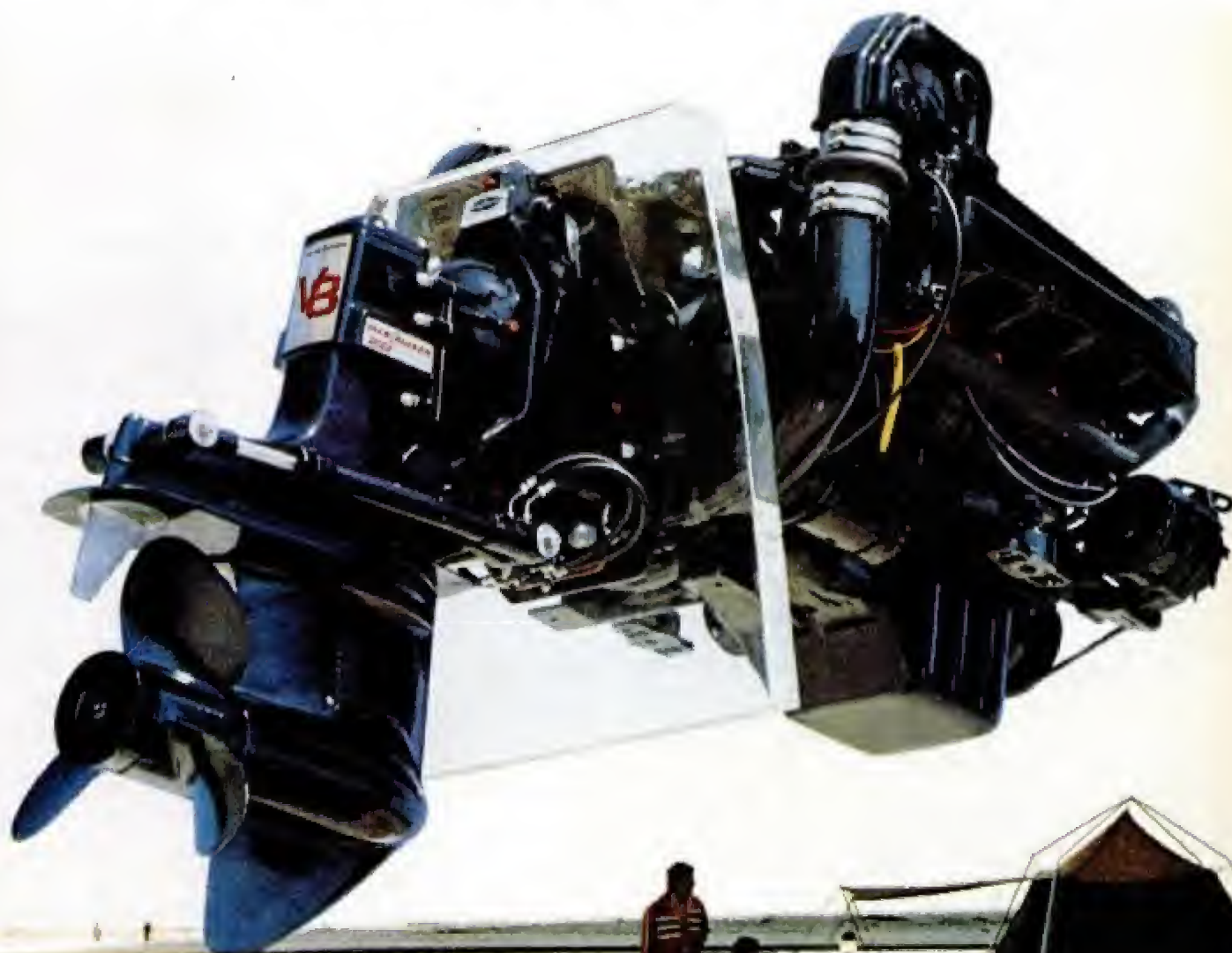
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BIG PIPE DREAM COMES TRUE!

(Continued from page 176)

each vertical support. The idea was adapted from a thermal control used in our Skylab space program. Liquid anhydrous ammonia, flowing up and down inside the columns in a continuous circuit, carries heat from the ground to the top and dissipates it to the air through finned radiators.

In other areas, engineers must resort to different tricks. In one region where the pipeline crosses a migration route for moose and caribou, the pipe will have to be buried underground to preserve the environment. To prevent the permafrost from thawing, refrigeration coils will be installed in the bedding under the pipe—that's how far engineers will have to go to avoid disrupting the environment and to assure a stable foundation for the line.

Laying the pipe will involve a seemingly endless parade of some of the weirdest-looking, most sophisticated machinery ever seen. Following the drilling rigs will come a towering mobile crane with a special jointed boom—like a human arm—to pick up the vertical columns and insert them in the holes. Behind this will roll a steady stream of equipment for cementing the columns in place, installing the cross members, hoisting the gigantic 80-foot pipe lengths onto the support shoes, making connections and, finally, clamping a thick insulating shell around the pipe. When finished, the line will contain 102,000 individual pipe sections.

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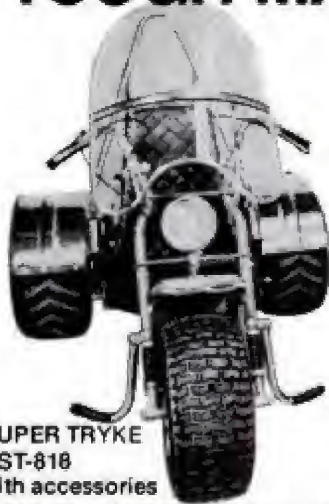
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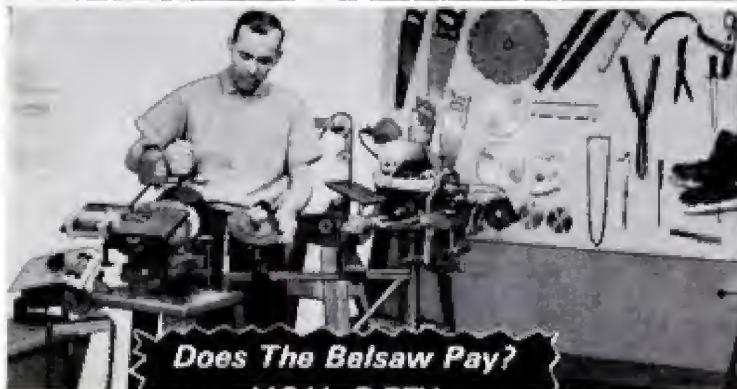
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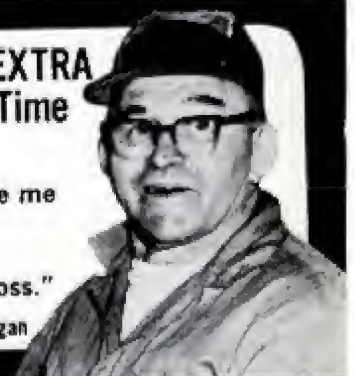
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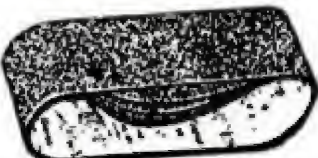
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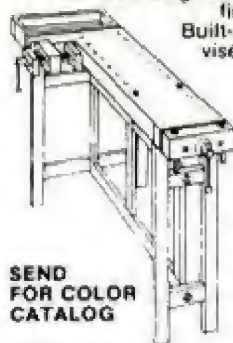
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